The Rice Spinner

Prepared for:
Griffin Kelly
Chicago, Illinois
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Executive Summary

Problem:

There are many rice washing techniques used in households around the world, but they all require using your hands to generate friction to clean the starch and dirt off of the rice. Our client, Griffin Kelly, asked us to design a product that allows our user, Susie Kelly, to clean the rice without directly touching it with her hands.

Purpose and Scope:

The objective of our project was to design a device that allows individuals who cook rice for their families to wash rice clean without touching the rice with their hands. We aim to make this product compact, durable, easy to rinse, and sustainable, and its associated processes as clean, time-efficient, and labor conserving as possible.

Methodology:

The team first conducted secondary research about current rice washing methods to prepare for our client interview. To develop our design, we had a group interview with our client to ascertain the requirements of our design. After brainstorming, we used an alternative matrix to evaluate how well each idea met the requirements. Our team picked the top three designs from the alternative matrix and tested them. Based on the results of those tests, we picked and developed a final design concept and built a mockup that we tested with our main user. We used the results and feedback of that test to design and build our final prototype.

Design and Benefits:

The Rice Spinner has a handle that cranks and attaches to a stem with two rice agitator flaps. When cranking the handle, the stem rotates and creates centrifugal force between the agitator flaps, rice, and water. The friction cleans the rice by stripping the starch and dirt from the rice. The lid of the bowl has a water hole, where the user can refill the bowl with water without taking the whole lid off. Additionally, there are drainage slits that allow the user to dump the water out without the rice falling out. The Rice Spinner satisfies three needs that existing products do not: efficiently agitating the rice, conserving labor, and conserving water.

- Cleans rice: The Rice Spinner uses centrifugal force to create friction between the rice, water and rice agitator flaps to clean the rice.
- Conserves labor: The spinning mechanism converts low energy stirring motion to high-speed agitation.
- Sustainable: The Rice Spinner uses approximately 1 cup of water less to wash the rice than our user's current method.

Introduction

There are many rice washing techniques used in households around the world, but they all require using your hands to generate friction in the rice. This friction strips the rice of starch and any dirt or chemicals (Appendix A). Additionally, if the rice is not washed, the starch can make the rice stick together and create clumps. One main way to tell if the rice is thoroughly cleaned is if the water runs clear when the rice is in it. Our team was asked to design a product that allows the user to clean the rice without directly touching it with her hands (Appendix B).

Existing solutions do not effectively clean the rice according to our user. Most solutions are similar to colanders so that they can drain the water easily. However, these products do not have a part to agitate the rice effectively, requiring the user to still submerge her hands to create friction in the rice. Furthermore, the slits in these products are too big and allow some of the rice to fall through. Some products have an additional whisk agitator, but the wires are too far apart to agitate the rice correctly (Appendix C).

Our design, the Rice Spinner, solves the problems that the previous products do not by utilizing a crank attached to a stem with two rice agitator flaps. The Rice Spinner employs a cranking mechanism that turns the agitator flaps inside the bowl. The centrifugal force of the crank creates the appropriate friction between the agitator flaps, rice, and water that cleans the rice of the starch and dirt. The Rice Spinner also has draining slits with fine mesh to stop any rice from falling out when dumping water out.

This report discusses the users, requirements, design concept, and rationale for our design. We also discuss limitations to our design and future steps to address them.

Users and Requirements

See Appendix B to learn more about users and requirements

Main Users of the Design:

Susie Kelly: The main user is Susie Kelly, a middle-aged woman who has been cooking rice for 40+ years. She washes rice at least twice a week but does not like touching the rice directly (Appendix C).

People who wash rice in a domestic setting: People who regularly wash rice in their households would use the device to wash their rice without directly touching it.

Major Requirements:

- Cleans rice without the user's hands getting wet: The user wants a device that can effectively wash the rice without using her hands. The device must be able to clean the rice since that is the main purpose of washing rice (Appendix C).

- Time-efficient: The user's process of washing rice currently takes around 5 minutes (Appendix D). The device should take around the same amount of time to clean the rice.

- Durable: The device will be a common household item, which may be used multiple times a week. The device must be durable to sustain multiple uses every week for multiple years (Appendix C).

- Compact: The device must be compact in order to be stored in the user's kitchen and cabinet storage (Appendix C). It also shouldn't take up a lot of countertop space in the kitchen so the user has room for other items.

- Easy to rinse between uses: The user will be using the device multiple times a week so it must be easy to rinse in between uses, similar to a regular bowl (Appendix C).

- Family feeding capacity: The user makes rice in order to feed herself and her family. She uses 1-3 cups of rice when she makes rice (Appendix C). The device must be able to hold 1-3 cups of rice and the necessary amount of water to wash it in order to be able to fit the user's needs.

- Water conservation: The device must have a water conservation feature in order to fit the sustainability theme of the project (Appendix E). A lot of water that is used during the rice washing process is not necessary, so the device must prevent the user from overfilling the rice with water.

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Design Concept and Rationale

The Rice Spinner is a device that allows the user, Susie Kelly, to wash rice without directly touching the rice or water with her hands. The Rice Spinner has a handle that cranks and attaches to a stem with 2 rice agitator flaps (Figure 1). When cranking the handle, the stem rotates and creates centrifugal force between the agitator flaps, rice, and water. The friction cleans the rice by stripping the starch and dirt from the rice. The lid of the bowl has a water hole, where the user can refill the bowl with water without taking the whole lid off. Additionally, there are drainage slits that allow the user to dump the water out without the rice falling out.

Figure 1: The Rice Spinner

The following sections describe the components of the device — crank and stem, rice agitator flaps, water hole, drainage slits— as well as the rationale for each component.

Crank and Stem:

The cranking mechanism is based on an existing mechanism for a salad spinner. The original mechanism dispersed the torque on an outer ring that spun a secondary bowl inside the first. We repurposed this mechanism to spin a food safe tube with agitator flaps on its central axis, allowing the user to clean rice keeping their hands dry. The cranking mechanism of the spinner attaches with an M8 thread, which we have connected to the stem (Figure 2). This tube descends from the middle of the lid to the bottom of the bowl, where the tube sits on top of a “nub” of plastic initially meant to hold the secondary bowl in place (Figure 3).

Figure 2: Thread on lid of the spinner

Figure 3: Stem connected to spinner

The stem is connected to the crank mechanism with a top plug that inserts into the stem. This plug was lathed to fit the inside diameter of the stem and then tapped with an M8 thread. The plug is made of ABS plastic, which was chosen as it is a food-safe material which is hard enough to be tapped with threads (Figure 4) (Appendix F). The stem is made out of polypropylene tubing, which was chosen for its food safety, and ease of prototyping. It is able to be cut and bought in a large quantity to make various iterations (Appendix F). A 2 inch deep cut was performed on the bottom of the stem to allow the agitator flap to connect with it.

Figure 4: Plug

Overall, the crank mechanism creates a centrifugal force that turns the stem and ultimately, strips the rice of starch and excess dirt without the user directly touching the rice. The crank mechanism has also continued to work after multiple testings each week with various amounts of rice, which we used to analyze the durability of the device.

Rice Agitator Flap

The silicone flap was pressed into a slit in the stem (Figure 5) (Appendix I), and a small rectangle was cut out of the bottom of the flap so it would not block the nub at the bottom of the bowl (Figure 6). During our user testing and feedback, our user liked the shape of the flaps because it could reach and agitate all of the rice in the bowl (Appendix J).

Figure 5: From top to bottom: plug, stem, agitator flap

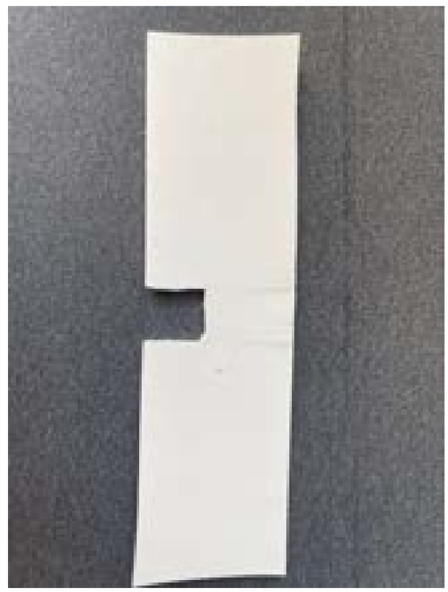

Figure 6: Agitator flap

Food grade silicone material was chosen due to the results of our performance testing (Appendix G). It is less stiff of a plastic/rubber, and it was found from our testing that stiff materials were harder to crank and resulted in the clumping of rice together. Additionally, since the silicone was less stiff, it could adhere to the rice better and create more agitation in the rice. This allows the process to agitate the rice as effectively as the user’s current rice washing method, making the process time-efficient and water-conserving. The user’s current method of washing rice takes approximately 5 minutes, which is the same as the device (Appendix D and L). The user’s current method also utilizes 5 cups of water, while the device utilizes 4 cups of water. Due to the efficiency of the rice agitator flaps in agitating the rice, the process is time-efficient and water-conserving.

Water Hole and Drainage Slits

When washing rice, our user uses multiple rinses to wash the rice until the water remains clear (Appendix D). In order to easily accommodate this part of the process, drainage slits and a water hole for refilling were implemented (Figure 7). Through user testing and feedback, the user found the process of refilling and draining the water to be simple. Grains of rice came out of the drainage slits and water hole and water would splash out of the water hole during user testing (Appendix J). Therefore, we added food safe mesh, which was suggested to us in our design review (Appendix K), to both of them so no rice will fall out while draining the water (Figure 8). Additionally, we added a silicone flap to cover the water hole to prevent spills and leakage during the washing processes (Figure 9).

Figure 7: Water hole and drainage slits

Figure 8:Bottom of lid showcasing mesh

Figure 9: Silicone cover

Ideally the flap would be able to clip down, but our final prototype requires that the user hold their hand against the top of the lid, which still ensures the user's hand stays dry at all times while cleaning the rice. The device is the size of a medium-shaped bowl so the water hole and drainage slits allow the product to be compact since no additional tools are needed to drain the water. The water hole and drainage slits also make the process more time-efficient since the lid does not need to be taken off to refill the water and the drainage part simply requires the user to tilt the bowl.

Bowl

The bowl allows the whole device to be encapsulated in one place. The bowl has a 10-inch diameter, making it a medium sized kitchen bowl (Appendix B). This allows the device to be compact and not require much countertop or cabinet space. The bowl can carry and wash up to 5 cups of water (Appendix B), which meets the family feeding capacity requirement of 1-3 cups of rice from our user. Additionally, the bowl is clear so the user can easily see when the rice water is clear, making the process more time-efficient than taking the lid off each time to check if the water is clear. Since the bowl has no additional features on it, it is easy to rinse in between uses.

Limitations and Future Development

The rice spinner meets most of the design requirements by cleaning rice, being time efficient, being compact, having the capacity to wash up to and over 3 cups of rice, and conserving water per wash when compared to simply rinsing the rice (Appendix L). That being said, the rice spinner does not fully meet the requirements concerning durability and ease of cleaning. Additionally, there are features which, if added, could benefit the usability of the rice spinner greatly.

The rice spinner has proven useful during prototyping and testing with no failures. However, it is made of primarily plastic parts which have begun to display signs of deterioration, such as play in the crank mechanism. There is no way to tell what the lifespan of the current prototype is without further extensive testing. However, based on this intuition, it would be recommended to build an iteration of the product with durability in mind. This would include sourcing differing materials for the crank mechanism, and designing the product to have easily replaceable parts.

In order to make the rice spinner itself easier to clean between uses, the stem must be further developed. As currently built, the stem allows water to enter through the bottom and slits in the side. This complicates the process of rinsing the spinner, as the user must disassemble the stem entirely to rinse it out. This includes removing the agitator flaps and unscrewing the plug from the crank mechanism. In order to prevent this inconvenience, and meet the requirement, the stem and agitator flap could be adhered to each other and sealed. This must be done using a food safe adhesive and sealant. Additionally, a bottom plug could be outfitted and sealed into the stem. This plug would have to be foodsafe, accommodate the slits in the stem, and allow for the “nub” in the bottom of the bowl to enter the stem, stabilizing the mechanism.

In regards to additional features, one potential inclusion for further iteration is re-working the covering flap to stick to the water hole and drainage slits on its own. This could be done by adding a latch to the lid, or by creating depressions in the flap that match up with the drainage slits and water hole. Additionally, implementing a rubber O-ring around the lid of the bowl would fully prevent water from escaping during use and ensure that waste water is only able to be poured out through the intended drainage holes. This was unable to be implemented as O-rings that fit the bowl’s circumference are not readily available, and we do not have means to manufacture them.

Conclusion

To summarize, our design meets the key needs of our primary user, Susie Kelly, who will use the device to wash her rice. The design uses these components to do so:

- Crank mechanism that connects to a stem and creates centrifugal force in the rice and water
- Agitator flaps that create friction on the rice to clean the starch and excess dirt off of the rice
- Water hole and lid that allows the user to refill the water from the top and keeps the water from splashing out during use
- Drainage slits to easily dump the water out (Appendix M)

Susie Kelly needs a device that can wash rice without getting her hands wet. The crank mechanism allows the rice to be washed effectively without directly touching it. Susie also needs the device to require a similar amount of time compared to her current rice washing method. The agitator flaps efficiently agitate the rice so the process does not require more time or effort to wash the rice. The device must also be durable, which the device has continued to work without issues during testing multiple times a week. The device is compact because it does not require any additional tools than the ones included, and the overall bowl is the size of a regular kitchen bowl. The bowl only requires a quick rinse; however, the stem requires detachment from the lid and a more thorough rinse. Additionally, Susie needs to be able to wash enough rice to feed herself as well as her family. The device holds up to 5 cups of rice, which is enough to feed her family. Lastly, the device uses one less cup of water than the user's current method of washing rice (Appendix L).

Appendix A: Background Research Summary

Introduction
Our project involves designing a device people who cook rice in their homes may use to wash the rice without getting their hands wet or dirty. Our initial assessment of the requirements of the design is to make the product and associated processes clean, time-efficient, labor conserving, compact, durable, easy to rinse, and sustainable. To better understand the needs of the design, we researched key ideas our client Griffin Kelly mentioned in his project description to begin the project by investigating (1) the significance of washing rice, (2) existing rice washers, (3) environmental considerations and (4) our goal design features for a suitable device.

Significance of Washing Rice
The main reason for washing the rice is to remove starch.

Figure 10: Rice plant [1]

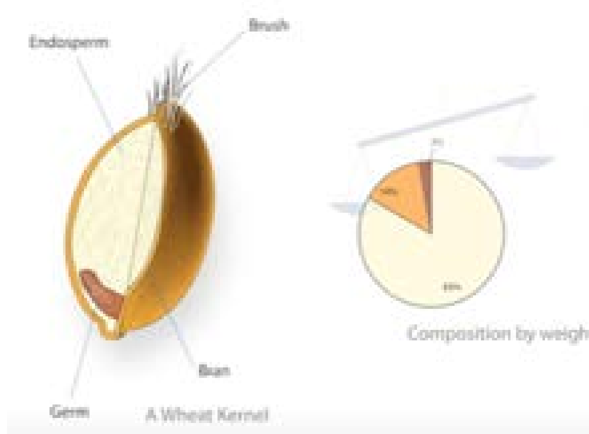

Figure 11: Rice layers [2]

A rice kernel on a rice plant, shown in [1, Fig. 10], has four major components The outside is the hull; once you remove it, you find the germ that's the actual embryo [2, Fig. 11]. The germ is where most of the fats, vitamins and other minerals of the grain are located. If you take off the hull but leave the bran and the germ, you will have brown rice. People started taking off the bran and the germ because brown rice spoils fast [2]. Bran and germ are rich in polyunsaturated fats, which can go rancid when exposed to air for too long [3]. Therefore, people remove that outer coat through milling - grinding the rice to reduce its outer layers into a powder that you can then sift so that the rice will not spoil fast.

Figure 12: Sticky rice [4]

Dr Wang, a carbohydrate chemistry professor at the University of Arkansas, says that the grinding process leaves behind a powdery residue that contains a lot of free starch. When the free starch is mixed with water, the free powder turns into the glue that clumps the cooked rice [4, Fig. 12]. But if you wash and drain repeatedly until the water is more transparent, that means you have washed off most of the free starch, and your cooked rice will be fluffier [4].

Existing Rice Washers

Rice washers come in different designs and sizes. Table 1 captures some of the various pros and cons:

Table 1: Description of existing products

product	description
 *Figure 13: Kotouki Japanese Rice Washer [5]*	The Kotouki Japanese Rice washer is made of plastic. It has strainers on the bottom and side to assure thoroughly drained rice. It has a footed bottom, which makes its cleaning easier [see 5, Fig. 13].

 *Figure 14: Stainless Steel Rice Washer [6]*	Stainless Steel Rice Washer is made of stainless steel, which makes the product lightweight yet durable. Its angled side and perforations allow water to rain without losing rice.
 *Figure 15: Japanese Style Rice Wacher [7]*	Japanese Style Rice Washer is an eco-friendly BPA-free container, which means it doesn't use organic compounds in its construction.

Rice washers come to meet different needs as some are durable because they are made of stainless steel, and some are environmentally friendly as they are made of eco-friendly materials. However, none of these designs is hands-free as they all require the user to use their hand to clean the rice, which makes the user's hand dirty or wet.

Environmental Impact

Sustainability is an essential component of our design process. One way to build a product is to optimise the lifetime of the product; design a long-performing product. A product lifetime measures how long a product [8, Table 2] and its components [8, Table 3] will last under normal conditions. For example, in Table 2 a computer is expected to work in a good condition between 2-6 years. This means that after that period of time the computer performance is expected to decline. On the other hand, Table 2 shows the different lifetimes of different types of timber. For example, Oak chestnut is considered to be a durable timber as its lifetime is between 15-25 years. After that range the timber will start to deteriorate.

Table 2: Lifetime of different products [8]

Type of product	Useful lifetime (years)
Small house appliances	3–4
Computers	2–6
Large house appliances	5–10
Cars	5–15
Electrical equipment	10–25

Table 3: Durability classes of different temper [8]

Durability class	Durability (years) Timber protected from the moist ground	Durability (years) Timber not protected from exterior conditions	Timber
I Very durable	More than 25	50	Iroko, red cedar, teak, rosewood
II Durable	15–25	40–50	Oak chestnut, larch, meranti, mahogany, black locust
III Moderately durable	10–15	25–40	Oak, walnut tree, red American pine, Oregon pine
IV Slightly durable	5–10	15–25	Balsa, birch, elm, linden, araucaria, fir
V Non-durable	Less than 5	6–12	Ash tree, plane tree, poplar, willow tree

The end of the lifespan cycle of a product is called disposal [8]. Multiple reasons cause disposal, including damage or improper usage of the product, performance degradation, structural fatigue due to regular use, and technological obsolescence.

A more lasting effect with similar functions will have less impact on the environment. A product with a longer lifespan will create less waste and decrease the demand for product replacement. The process of pre-production, production and distribution of the new product will cause further consumption of resources and emissions. Two products with the same function may have different lifespans, as illustrated in [8, Fig. 16].

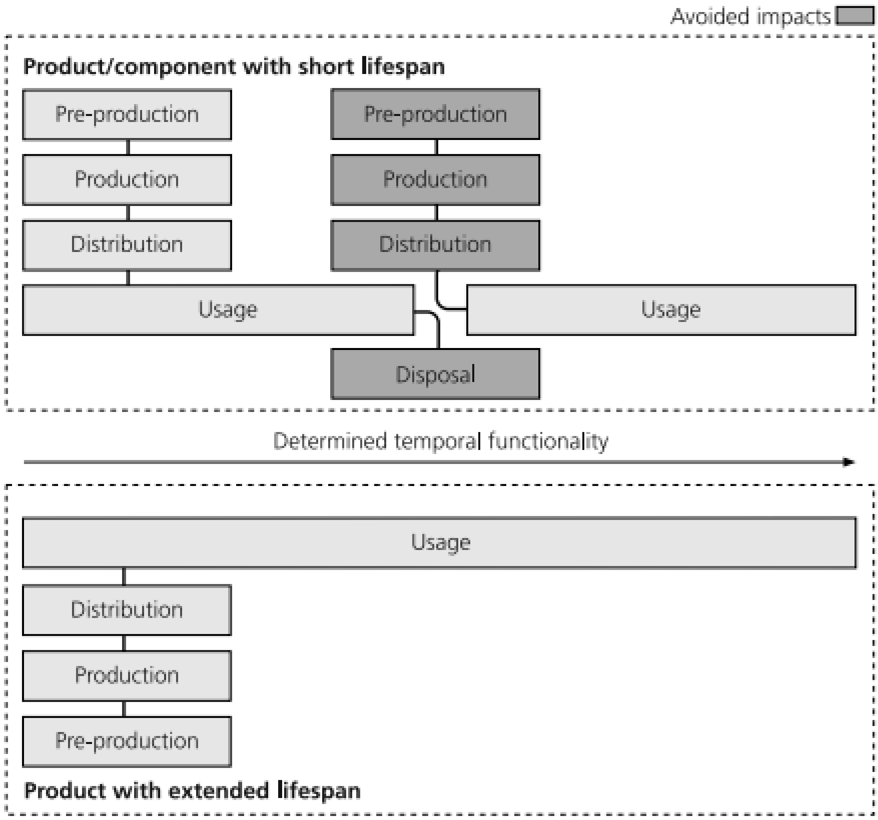

Figure 16: Environmental advantages of product’s lifetime extension [8]

As previously mentioned, longer lifespan products consume less energy and materials. Therefore, our team is planning to make our product’s life span long by making a material selection that would increase the solidarity of the product.

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Appendix B: Project Definition

Project name: Rice Washer

Client: Griffin Kelly

Team members: Serena Hwang, Ziad Elbadry Shaker, Enrique Shiels, Gabriela Oyarzún Batlle

Date: May 18, 2022

Mission Statement
Our mission is to allow individuals who cook rice for their families to wash rice clean without touching the rice with their hands. We aim to make this product compact, durable, easy to rinse, and sustainable, and associated processes clean, time-efficient, and labor conserving

Project Deliverables
- Final report
- Final presentation
- Final prototype

Constraints
- Due date: June 6, 2022
- Budget: <$100
- Fit sustainability theme of class

Users and Stakeholders
User list
- Susie Kelly
- People who wash rice in a domestic setting

Stakeholder list
- Sustainability enthusiasts
- User’s family members
- Users who have water shortage issues

User(s) Profile
Susie Kelly is a middle-aged woman, who has been cooking rice for 40+ years. She washes rice at least twice a week, but she does not like getting her hands wet during the rice washing process.

Illustrative User Scenario
The user in the illustrative scenario below is based in part on an interview with Susie Kelly.

Susie Kelly has been cooking rice for multiple decades, since childhood. She recalls the toiling nature of the task, her own mother asking her to wash the rice over and over until the water being used was crystal clear. Many years later, and having raised her own children now, she is still faced with the tiresome task of repeatedly rinsing rice, a staple of many people's diets, and an invaluable aspect of Asian culture. This tedious nature is emphasized when she has a minor cut or has gotten her nails done. Not having any better solution, she may don a pair of gloves. However, this is but a mere bandaid to the true problem: rice washing has had the same down sides for decades, maybe even centuries. Griffin Kelly, Susie's son, has been working with his mother to attempt to discover some potential solutions. However, current solutions are only modifications to common colanders. The Kellys are searching for a true solution to the tiresome task of washing rice while making the process more sustainable.

Table 4 : Project requirements and specification

Need (see Appendix C)	**Metrics**	**Specification**	**As Built (tested for 1 cup of rice)** (see Appendix L)
Cleans rice without user getting their hands wet	Water rinse color Hand dryness	Clear water (cannot agitate any more starch off)	Clear water after 4 rinses at a medium pace Dry hands
Time-efficient	Minutes of washing process	~5 minutes Based on client's rice washing method now (Appendix C)	5 minutes
Durable	Product lifetime	~10-15 years Based on average kitchen appliance lifespan	40 years Based on average ABS plastic lifespan
Compact	Diameter of bowl	~10 inches Based on average medium sized bowl	10 inches
Easy to rinse between uses	Time to clean	~2mins Based on client interview (Appendix C)	3 minutes

Family Feeding Capacity	Cups of rice	1-3 Based on client interview (Appendix C)	4 cups
Sustainable: Water Conservation	Amount of water used	5 cups of water Based on user observation summary (Appendix C)	4 cups of water

See Appendix L for the *Performance Testing of our Final Prototype*

Appendix C: Client Interview Summary

Introduction
We had our initial interview with our client, Griffin Kelly, on Wednesday, April 6th, 2022 at 5:00 p.m. via zoom. The purpose of the meeting was to learn more about Susie Kelly's rice washing logistics, existing rice washing products and their problem with them, and her product preferences. This appendix summarizes what we learned about the problem, users, and requirements.

Problem
The problem our client presented to us is that the process of washing rice with current rice washing products/devices/techniques is tedious, and they imply getting your hands on rice and water. As stated by Susie, this is uncomfortable if you have a band-aid, or if you just got your nails done. Besides that, the overall feeling of having wrinkly hands after washing rice is unpleasant.

Background Information
We asked Susie background information questions in order to learn more information about how she prepares her rice. She usually washes rice twice a week, and washes each batch around 3-4 times. Additionally, she uses many different rice brands rather than a specific one and prepares her rice using a rice cooker. Her rice washing method consists of filling a bowl of rice with water, agitating the rice in between her palms, draining the water, and then repeating.

Attempted Prior Solutions
Mr. Kelly and his mother have actively searched for rice washing solutions on various Japanese culinary websites.They do not find these attempts to solve their problem helpful, and said that they did not like any aspect of their use, except the selection of metal as the material of construction. The project partners found them to be similar to colanders, and stated that the slits were too large, allowing rice to be wasted in the washing process.

Requirement
Our client identified these requirements for the design:

- Capacity
  - Can hold 1-3 cups of rice, enough for a family meal
- Durable
  - Can last up to 20 years
- Cleans the rice
  - Removes excess starch on the grains
- Time-efficient
  - Does not take over 10 minutes to clean rice.

- Compact
    - Can be kept in the user's kitchen
    - Can be stored away in the cabinets
- Easy to rinse
    - Does not require specialized tools or processes to rinse
- Sustainable
    - Reduces water consumption of rice washing process

Users

- Susie Kelly
- Individuals who wish to wash rice in a non-commercial setting

Conclusion

In conclusion, we learned about the user's experience washing rice, their experiences with other products, and the requirements that they have for this product to be considered successful. Our team is following this initial project partner interview by conducting a user observation with Mr. Kelly and his mother to observe their rice washing practices, and get a better understanding of their needs.

Appendix D: User Observation Summary

Introduction

The observation was conducted by members of Teams 1 and 2 of DTC section 21 on Wednesday, April 13th. The teams met with the client Griffin Kelly and the user, his mother, Susie Kelly. This observation aimed to understand how she washes rice on a day-to-day basis and to get more information and insight about her process and preferences. The session lasted about 20 minutes. This appendix explains the methodology used to lead the user observation, background information about the user, and task observation.

Methodology

The observation took place online via Zoom. The teams were on campus, and the user and client were in Griffin's apartment's kitchen. The user performed her rice washing technique step by step. After that, Susie and Griffin were asked about their preferences and needs in more depth.

Results:

<u>Background information about the user and rice washing:</u>

The user is an Asian woman in her middle age who has had the life-long habit of cleaning rice, which, she states, was passed from her ancestors. The user pointed out that the best way to see if the rice is clean, as she was taught, is when you can "the rice through the water." The user has tried several rice washing tools, like colanders and whisks, but none of them have satisfied her most important requirement: to not get her hands dirty and wet.

<u>Task observation (5 min approximately):</u>

Process:

1. Put about 2 cups of rice in a stainless steel bowl (Fig. 17).

Figure 17: Rice in bowl

2. Put about 2 cups of water from the tap into the same bowl or enough water to cover the rice (Fig. 18).

Figure 18: Pouring water from the tap into the bowl

3. Put rice in between hands to massage it (Fig 19).

Figure 19: Hand rubbing method

4. Grabs rice on each hand and rubs individually (Fig. 20).

Figure 20: Individual hand rubbing method

5. Alternate between steps 3 and 4 until the water is cloudy/dirty.

6. Pour water into the sink and put a hand on the edge of the bowl to catch any rice that could get out of the bowl (Fig. 21).

Figure 21: Water pouring into the sink

7. If any rice grain falls into the drain, it will be disposed of.
8. Repeat steps 1 to 7 until the water doesn't come out cloudy/the rice can be seen through the water.

Further observations:

- The process required four rinses plus one additional load of water to check if the rice is visible through the water.
- It was observed that no rice was wasted while pouring water out of the bowl.

<u>User preferences:</u>

An interview following the rice-washing observation yielded the following preferences:

- The user prefers to use a bowl roughly similar to what she has. Medium to large in size, with a curved bottom, like a mixing bowl, and made of stainless steel or plastic.

Additional information

- Type of rice used by the user: Long grain white rice
- Inconveniences of the method used until now:
    - It is unsanitary. Hands need to be completely clean; users could have band-aids on.

- It feels uncomfortable to have wrinkly hands afterward.
- Labor-consuming.

Important things to keep in mind:

- Some rice needs less washing, i.e., brown rice.

Analysis/conclusion:

Table 5: User observation table

Observations	**Opportunities**	**Follow-up**	**User suggestions**
The task of washing rice the way the user has been doing is too labor-consuming.	Create something less labor-consuming and has an overall more comfortable user experience.	Try to find a way to make the product as less labor-consuming as possible.	“If I didn’t have to sit there and clean it, it would be great. If I could put it somewhere (...) and push a button”
The user doesn’t like to get their hands in the water because of sanitary and aesthetic reasons.	Create a product that will allow the user to keep their hands off the water and rice.	Try to figure out how we could modify/replicate a salad spinner or something with a similar mechanism.	“I’ve always thought of something turning with like a paddle. Kind of like a salad spinner”
The user was using long-grain rice during the observations.	Try to test the final product with different types of rice, and make sure it works with all of them.	n/a	Different types of rice need less washing, i.e., brown rice. User prefers we test with different types of rice.
For two cups of rice, the user used 4 cups of water to wash it, and one cup of water to check if the rice was clean.	Create a product that minimizes water usage.	Look into/test different techniques or products that minimize water usage.	The user showed no interest in minimizing water usage.

Appendix E: Ethical Sustainability Report

The same celebrities who fawn over Greta Thunberg, describing her as an inspiration and trailblazer and themselves as starstruck and galvanized, are patrons of the most pernicious purveyors of climate change, including megayacht builders, private jet charter companies, and extravagant mansion constructors. For the super-wealthy individuals of the world, both high- and low-profile, sustainability-as-a-lifestyle appears to have solidified its status as an important part of the cultural moment, so much so that you would be hard-pressed to find a single Western billionaire-philanthropist without some sort of climate initiative under their belt. However, there is a jarring disconnect between the interests in climate preservation of the uber-rich "eco-warriors" and their earth-degrading actions. This essay seeks to explore the impact of socioeconomic identity on one's sustainability habits and how for high-income individuals, eco-friendly intentions and even actions do not negate their typical habits' carbon footprint.

It's not that the high-income environmentalist community does not have legitimate environmental aims. It's just that, by virtue of having access to all that they have access to, and living the lifestyle associated with their income, their efforts prove ineffective. A 2017 study found that, overwhelmingly, " individuals with high pro-environmental self-identity intend to behave in an ecologically responsible way, but they typically emphasize actions that have relatively small ecological benefits" [1],such as purchasing popular "green" products, big or small, such as organic food upto an electric car. In essence, even for those who consider themselves very ecologically conscious, socioeconomic identity has a far greater bearing in one's individual carbon footprint than any personal climate change beliefs. Another way to consider this is to picture an ecologically indifferent low-income individual, who is more likely to use public transportation, fly less, and use less electricity than your typical high-income "eco-friend".

The relationship between socioeconomic status and carbon footprint is much stronger than the relationship between green motivations and carbon footprint. This is well-researched; in fact, "study after study finds that the primary determinant of a person's actual ecological footprint is income…self-identification as "green" is toward the bottom of the list of what actually determines impact, with mostly marginal effects." [2] The same "Good intents, but low impacts" study found that "environmental self-identity did not predict overall energy use or carbon footprint," [1] and in fact, those who considered themselves very environmentally conscious oftentimes had a marginally worse level of energy use as compared to those environmentally indifferent.

This is because of the fact that some of the more eco-conscious, visible decisions that may be made by those in the upper class (such as buying more expensive electric cars) does not outweigh the fact that they are unwittingly making other decisions that contribute to a larger footprint. Oxfam International, a global organization, states that “the richest 10 percent of households use almost half (45 percent) of all the energy linked to land transport and three quarters of all energy linked to aviation. Transportation accounts for around a quarter of global emissions today, while SUVs were the second biggest driver of global carbon emissions growth between 2010 and 2018.” [3]

For climate change action, the acts of wealthy people that are supposed to represent and amplify their belief in making the world greener oftentimes result in more of a strain on the environment, not less. Jeff Bezos’s “Bezos Earth Fund,” a $10 billion initiative that is supposed to “fund scientists, activists, NGOs—any effort that offers a real possibility to help preserve and protect the natural world” [4], is an apt example. Despite Bezos’ claims, “some have already drawn attention to the irony of his decision given Amazon’s enormous carbon footprint and reliance on continuous cheap consumption.” [4]

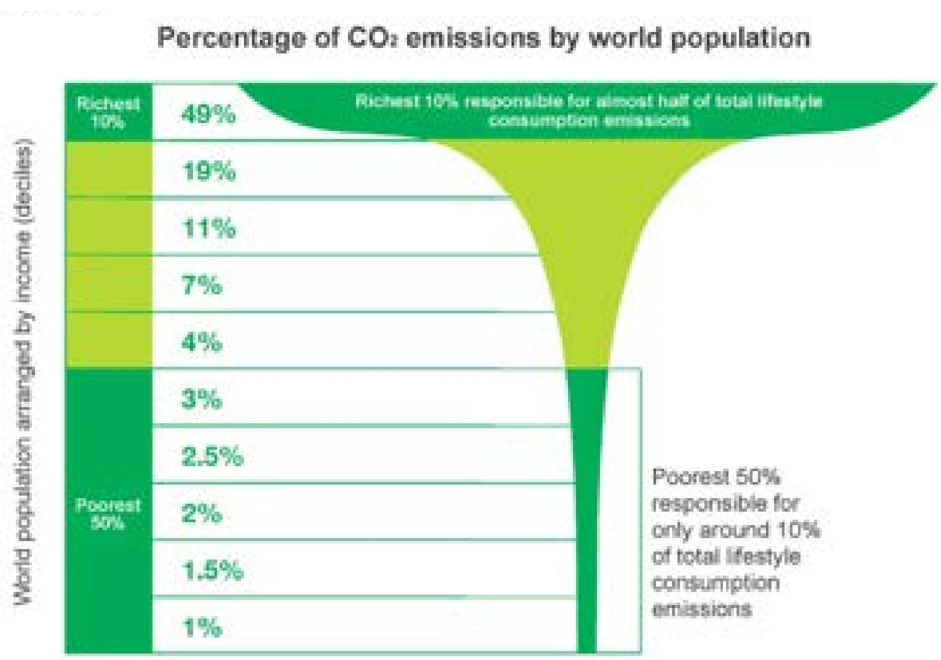

Figure 22: [Global income percentile relating to carbon emissions] [2]

On the other hand, low-income individuals frequently make very environmentally smart decisions—not to prove themselves eco-warriors, but out of concern for their financial well-being. In India, where over two-thirds of the population lives in poverty, the world’s cheapest solar power is produced. People using solar power in India have not necessarily made that decision because it is on trend as a sustainable solution, but because it makes far more sense for them economically.

It is also important to note, though, that “the buying decisions of the rich mean much more in the fight against climate change than those of most people.” [5] While the philanthropy and proclaimed climate activism of high-income people tends to have a net negative impact on the environment, rich individuals cutting back on the luxuries they're used to and living more like the average person is a lot better for the environment than any trendy, pop-sustainability. This is supported by Oxfam's report and [2, Fig23] which says that " The richest 10 percent accounted for over half (52 percent) of the emissions added to the atmosphere between 1990 and 2015. The richest one percent were responsible for 15 percent of emissions during this time – more than all the citizens of the EU and more than twice that of the poorest half of humanity (7 percent)."[3] Pop-sustainability can be outdone by ensuring that large companies and the upper class put their genuine best foot forward in ensuring that the masses are sustainable.

Small companies can lead the way by showing large companies how it's done. Our team aims to design a sustainable rice washing solution. Approximately two thirds of the world eats rice as a staple [6], so allowing the people who choose to wash their rice do so in a sustainable manner will have real impacts. While conserving water in the rice washing process is our goal with this design we understand that it will not save the world. We intend to make one process more convenient to a specific user, and increase sustainability for an aspect of people's lives that they may not typically think about.

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Appendix F: Expert Interview Summary

This appendix summarizes information from our team's meeting with Northwestern Shop Professional Bob Taglia.

Date of Interview: Various, beginning April 6th, 2022

Shop Professional: Bob Taglia

Location of Meeting: Northwestern University's Ford Motor Company Engineering Design Center Prototyping Lab

Team Members Present: Enrique Sheils, Serena Hwang, Gabriela Oyarzún Batlle, Ziad Elbadry Shaker

The purpose of these meetings were to gain information regarding how to proceed with mock-up ideas and to understand the materials available to us. Throughout the quarter, we consulted with Taglia informally in order to gain insight on particular prototyping processes.

<u>Food Safe Materials</u>
We consulted with Taglia regarding various food safe materials. We hoped for our user to be able to use our final prototype, therefore selection of food safe materials were crucial. Taglia directed us towards food safe choices of materials for our prototype. These included silicone, polypropylene, ABS, hot glue, rivets, and food safe mesh.

<u>Connecting Parts</u>
Because many of the materials we chose are food safe plastics, joining them together was a challenge. Many parts did not stick together when hot glued, and there were limited options for adhesives, none of which were food safe. Taglia directed us to use pressure fitting for some options, such as the plug with the stem, and directed us to use ABS, a food safe plastic that is hard enough to hold threads. Additionally, he recommended rivets to hold the flap above the drainage slits and water hole.

<u>Creating Cuts</u>
When it came time to create cuts or drill holes in our prototype, and we were unsure of the exact tool needed, Taglia happily guided us to the proper machinery needed. For example, we used the bandsaw to create the bottom slit in the stem, in which the agitator flap fits.
<u>General Information</u>
Taglia emphasized that the materials he discussed are "cheap and easy," and that we should follow up using McMaster Carr (or Amazon if needed) to build our orders and send them to him.

Appendix G: Performance Testing: Flaps

Purpose
The purpose of the performance test was to test which material and shape would be used for the rice agitator flaps. The rice agitator flaps create a centrifugal force with the cranking motion, which cleans the rice of its starch and dirt. Three different flaps were tested: (1) polypropylene flaps with holes, (2), polypropylene flaps without holes and contours to bowl shape, and (3) silicone flaps (Figure 23). Our objective was to determine which flap cleaned the rice the most effectively (measured through how much water was used) and comfortably.

Figure 23: Different flaps tested (Silicone on top left, polypropylene without holes on top bottom, polypropylene with holes on right)

Methodology
Through using the device to wash rice, the three different flaps were tested and compared. The stem was taped onto the bottom of the crank mechanism of the bowl. For each flap, one cup of rice was placed into the bowl and water was added. The rice was washed until the water was clear. We then compared the comfortability and effectiveness of each flap.

Results
Table 6 shows the benefits and drawbacks that were noticed during the testing of each flap.

Table 6: Benefits and drawbacks of each flap

Flap Type	Benefits	Drawbacks
Polypropylene with holes	Agitates rice aggressively so water is clearer faster	Hard to crank Breaks rice
Polypropylene without holes and contours to bowl	Covered more area within the bowl so could reach all the	Didn’t agitate rice as well as the others

	rice	Encountered more resistance when cranking (broke connection of stem to lid a lot) Rice clumped together on one side of flap
Silicone	Floppy material so curved to the rice when spinning Easy to crank (less force needed) Agitates rice well	Bends out of shape easily Doesn’t reach all the rice

Conclusion and Limitations

From the data obtained from the testing, it can be concluded that the silicone flap is the easiest to crank compared to the polypropylene flaps, which are stiff and meet more resistance. Although the polypropylene with holes flap agitates well, the drawback of the crank needing more force makes the silicone the best choice.

A limitation of this test is that we only had a small amount of silicone to make the flaps, which made them the smallest of the three tested. However, the centrifugal force in the water allows all the rice to be agitated.

Appendix H: Bill of Materials

Table 7: Bill of materials

Material / Product	Dimensions	Amount	Price
Salad spinner	N/A	1	$19.99 USD + tax
ABS rod	1” diameter, 1” length + ~ 3” to secure in the lathe.	1	$2.96 USD + tax
Food Industry High-Temperature Silicone Rubber Sheet	21.88 inches^2, 1/8" Thickness	1	$16.95 USD + tax
Hard Polypropylene Plastic Tubing for Air & Water Semi-Clear White	5/8" ID, 3/4" OD, 4.5” length	1	$0.90 USD + tax
Mesh	10” x 10”	1	$7.00 USD + tax
Total:		$47.80 USD + tax	

Appendix I: Instructions for Construction

The following table (Table 8) lists all materials one will need to build the Rice Spinner.

Table 8: Materials used for construction

Materials	Dimensions	Quantity
ABS rod	3’ length 1’ diameter	1
Food Industry High-Temperature Silicone Rubber Sheet	21.88 inches^2, 1/8" Thick, 50A Durometer	1
Hard Polypropylene Plastic Tubing for Air & water Semi-Clear White	5/8" ID, 3/4" OD, xxx “ length.	1
Acrylic Rivets	3/8” diameter	1
Rice spinner (link)	n/a	1
Food-safe mesh	3” x 3”	1

Note: See Bill of Materials (Appendix H) in report for detail on cost and part numbers.

Tools:
The following tools are required to construct this device:
- Lathe Machine
- M8 tap
- 3/8” drill bit
- Center drill
- Band saw or Hacksaw
- Utility Knife
- Ruler
- Permanent Markers
- Hot Glue Gun
- Scissors

Preparing Salad Spinner:
1. Take the lid off and take off the inside colander/bowl, and disregard it
2. Unscrew the cap attached to the central axis on the bottom of the lid, and disregard it

Manufacturing the stem:

To manufacture the structural tube:

- Cut out a 4.75” tube from the Hard Polypropylene Plastic Tubing
- Place one of the ends vertically on the band saw and cut out a 2” by 0.0625” hole (Figure 24)
- File the edges to get rid of scraps of the plastic

See Figure 25 for a dimensioned drawing of the tube.

Figure 24: Slits on tube made from bandsaw

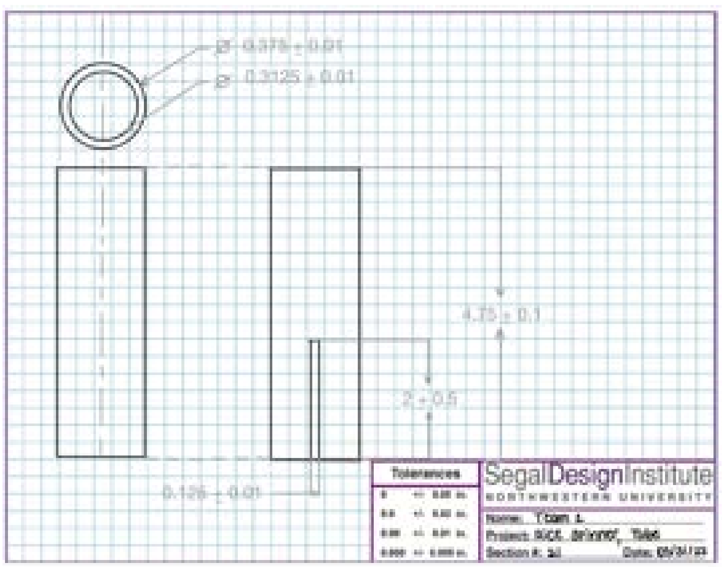

Figure 25: Dimensioned drawing of tube

Manufacturing the plug:

To manufacture the connecting plug:

- Find a 1” collet and put the ABS stock on it.
- Put that on the lathe and secure it in place.
- Get a cutting tool (Figure 26).
- Cut the stock until it’s 0.63’ diameter and 1’ length.

- Tap the stock 0.75’ deep with a center drill.
- Tap the stock with a 0.2638 drill bit 0.75’ deep.
- Tap the stock with the M8 on the lowest speed possible 0.75’ deep. When the bit gets to the desired depth, stop the lathe, put the turning in reverse, turn on the lathe, and proceed to take the bit out.
- Get a parting tool and cut the part out (Figure 27)
- File the edges for a smooth result.

See Figure 28 for the final product of the plug.
See Figure 29 for the dimensioned drawing of the plug.

Figure 26: Cutting tool for lathe

Figure 27: Parting tool for lathe

Figure 28: Plug lathed from ABS

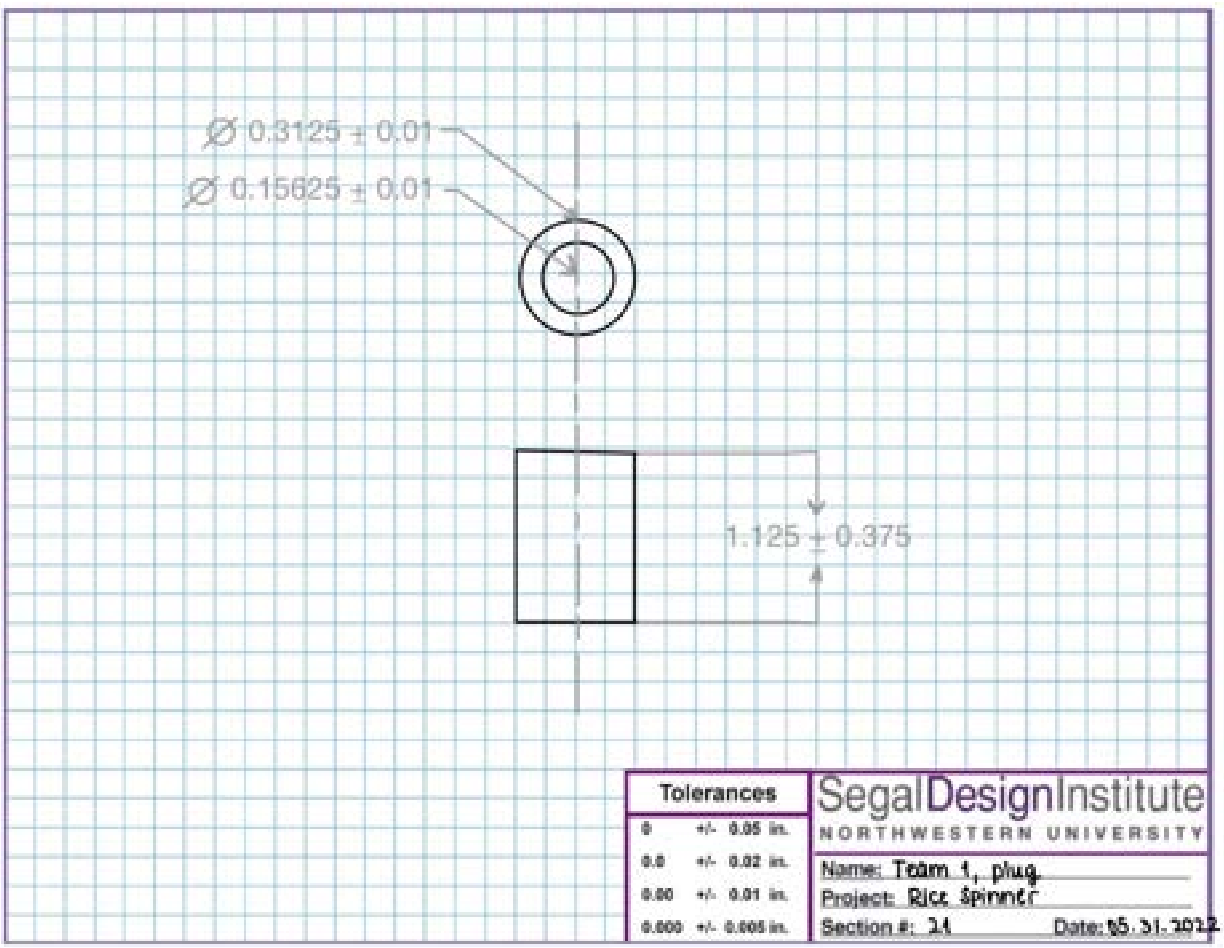

Figure 29: Dimensioned drawing of the plug

Manufacturing the flap:

To manufacture flaps (Figure 30)

- Cut out a 6.5” by 1.75” piece.
- Make another cut 3” away from the bottom edge on both sides, creating a 0.625”

See Figure 31 for a dimensioned drawing of the silicone agitator flap.

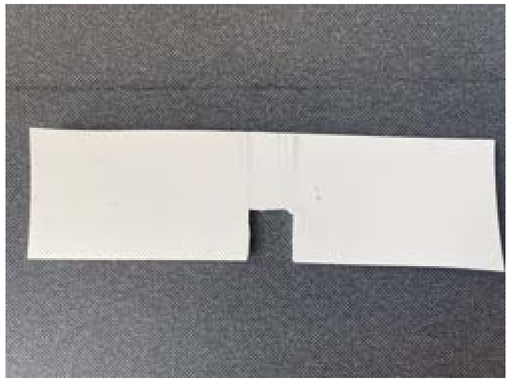

Figure 30: Silicone agitator flap

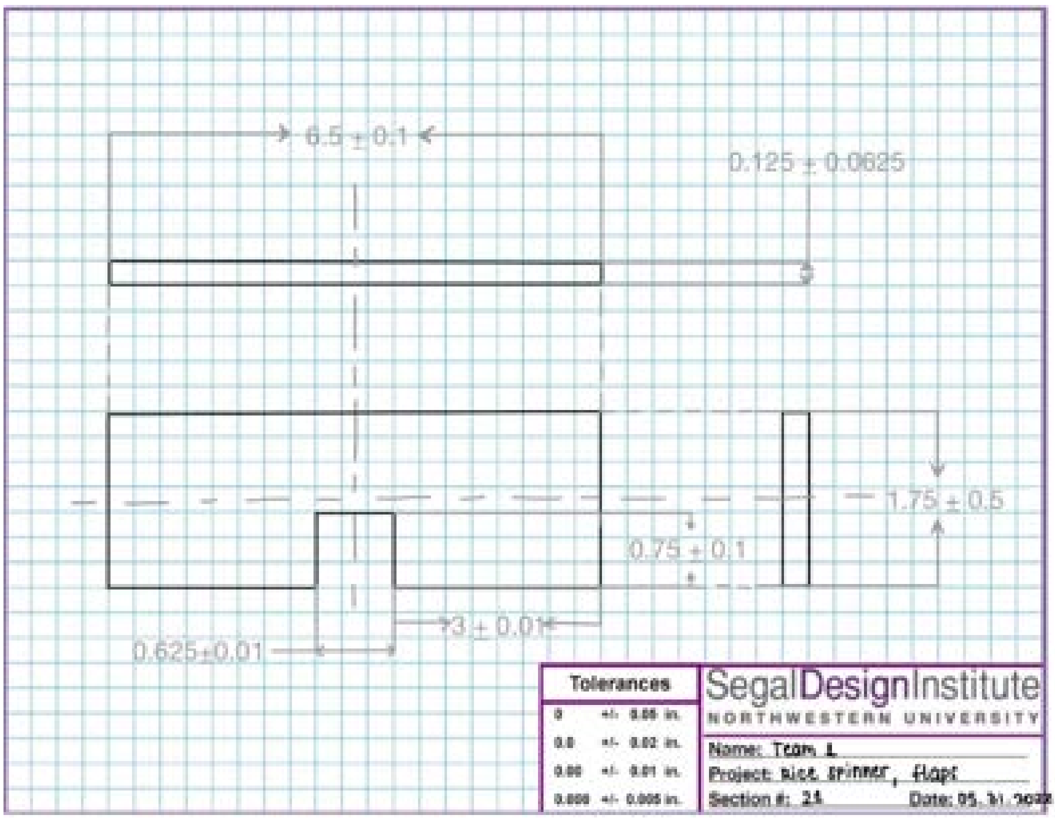

Figure 31: Dimensioned drawing of the agitator flap

Manufacturing the silicone cover:

To manufacture the silicone cover (Figure 32):

- Cut a 3.5” by 3” piece from the silicone sheet
- Line the sheet up on the lid so that it covers both the water hole and drainage slits
- In the top corners of the sheet, using a 3/8” bit, drill through the sheet and the lid (Figure XX)
- Screw in acrylic rivets on each of two corners to secure the sheet

See Figure 33 for dimensioned drawing of the silicone cover flap.

Figure 32: Drilling holes for cover to screw into

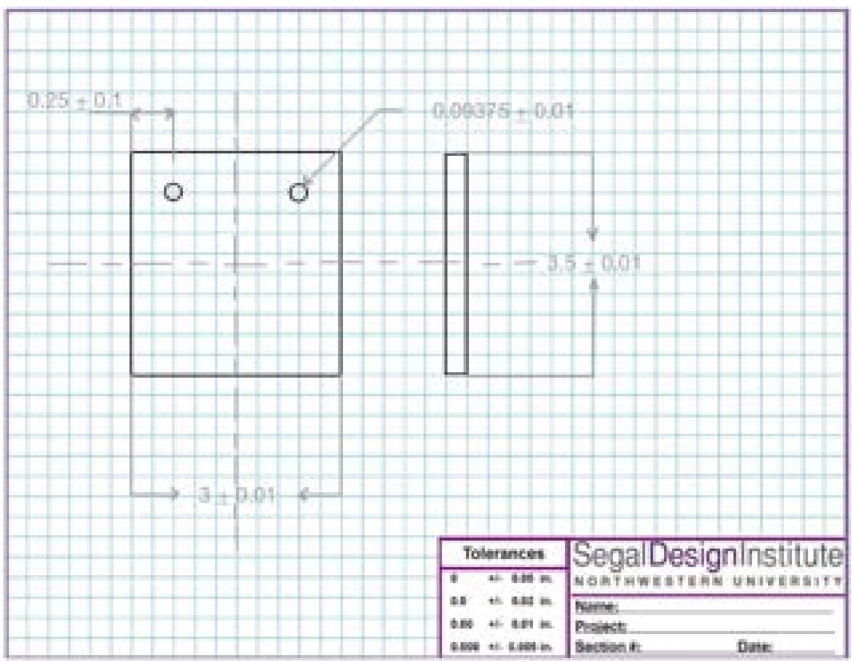

Figure 33: Dimensioned drawing of the silicone cover flap

Bringing the stem together (Figure 34 and 35):

- Press the flaps into one end of the structural tube.
- Press the connecting plug into the other end of the structural tube.
- Screw the stem into the tap of the spinner.

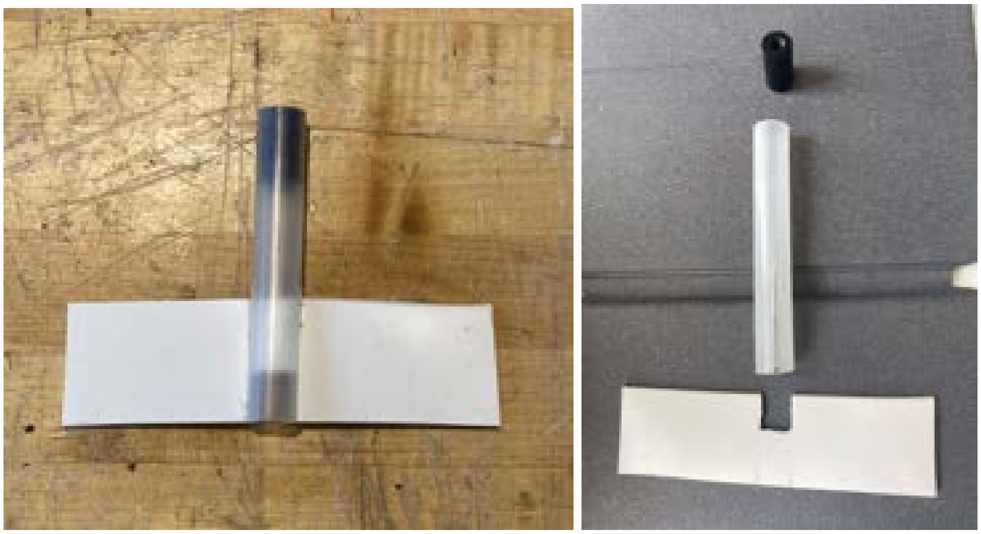

Figure 34 and 35: Stem with flaps and plug

Manufacturing the mesh cover:

To manufacture the mesh cover (Figure 36 and 37):

- Cut a 3’’ x 3’’ piece of mesh from the roll
- Contour pieces to fit over the water hole and over the drainage slits
- Use hot glue to adhere
- Cut off any pieces that are sticking out

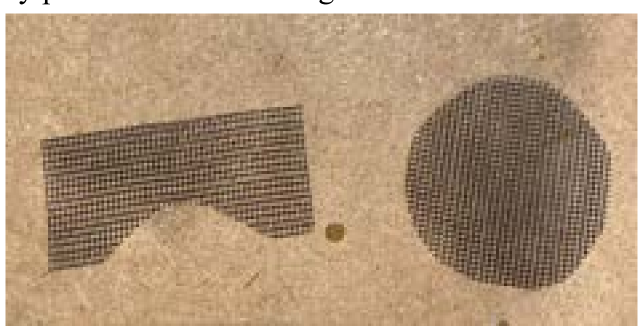

Figure 36: Mesh pieces for drainage slits (left) and water hole (right)

Figure 37: Mesh cover over water hole and drainage slits

After bringing everything together, the Rice Spinner should look like the following figures (Figure 38 and 39):

Figure 38: Final product (inside lid)

Figure 39: Final product (outside)

Appendix J: User Feedback and Testing Report

Purpose
The purpose of the user testing was to determine if the user, Susie Kelly, found the design comfortable and effective, as well as what she liked and disliked about the current mockup. The purpose of this user testing was to learn: (1) whether the product would be comfortable for her, and (2) whether the product effectively cleaned the rice to her standards.

Test methodology
On May 18, our team set up a Zoom meeting with Susie Kelly to give her a demonstration with the mockup and ask her questions pertaining to the overall design on it. The mockup consists of a modified salad spinner, with a stem coming down from the crank mechanism on the lid (Figure 40). The stem has two flaps coming off of it, where each flap has holes in it (Figure 41). When cranking the top handle, the stem spins and the flaps create centrifugal force in the water. This centrifugal force removes the starch from the rice. The holes in the flaps allow for water to travel through so the cranking motion does not require too much physical exertion.

Figure 40: Overall mockup design

Figure 41: Mockup stem and flaps

Since the testing session was done over Zoom, a team member demonstrated using the mockup so that the user could see the process. The team member added 1 ½ cups of long grain white rice and 20 fluid ounces of water to the bowl. The rice was agitated for 20-30 seconds and then the water was dumped out. This process was repeated three times, adding the same amount of water each time, before the rice was cleaned. After each agitation round, the water was dumped out into a pot in order to measure the amount of water used in the process from start to finish. Throughout the process, the team asked the user to imagine that she was the one using the mockup so that we could ask her general questions about her thoughts on the overall design and specific aspects of it after the demonstration was over.

Feedback

Likes/Concerns:

Tables 9 and 10 summarize the feedback received from the user testing based on the questions asked after the demonstration process. Table 1 summarizes the aspects the user liked. Table 2 summarizes the aspects that the user was concerned about.

Table 9: Aspects the user liked

Aspects User Liked	Comments
Compact	The user liked the size of the bowl since it could wash from 1-5 cups of rice, but it could still be stacked with other bowls.
Easy to Use	The user liked that everything could be put into the product without needing additional parts to wash the rice. She also enjoyed that the overall process was straightforward.
Clear bowl	The user determines how clean the rice is based on the cloudiness of the water, so the clear bowl will allow for her to see the water easily.
Drainage slits + Water hole	The drainage slits make it easy for the user to drain the water and the water hole makes it easy to refill the water without taking the lid off.
Agitation	The user liked that the product agitated the rice well while washing it. She said that after one cycle of washing the rice, the water looked much cleaner.
Amount of water used	The user mentioned that the product used less water than she normally does by looking at the pot of water used afterwards. The product used 20 oz per wash (60 oz total).

Table 10: Aspects the user was concerned about

Aspects User was Concerned About	Comments
Water hole	The user was concerned that water would splash out of the hole while spinning the water, which happened during testing.
Drainage slits	The user was concerned that rice would come out of the slits when pouring the water out since it happened during testing.
Different rice types	The user wanted to know how well the product worked with different kinds of rice since the product was demonstrated with long grain rice.
Rice sticking to sides	The user was fine with using a spatula to get the rice out of the bowl at the end, but brought up an idea of making the spinning axle detachable so that it could double as a spatula.

<u>Comfortability:</u>
We also asked Susie a few more questions about the comfortability of the product. Particularly, we asked if the cranking motion would be comfortable and if dumping the water out of the bowl would require too much exertion. The user liked the cranking motion and thought that she would have no problems dumping the water out.

Analysis, conclusions, and limitations
<u>Analysis of results</u>:
The user enjoyed the overall design of the mockup and liked that she would not need to touch the rice directly with her hands. She also liked how well the spinning motion cleaned the rice and mentioned that the process used less water than she usually does.

Her main concerns were water splashing out while spinning and rice coming out while draining the water out. Potential iterations on the design could include adding a lid to the water hole and mesh to the drainage slits to stop the water and rice from coming out unexpectedly. Another concern the user had was rice sticking to the sides of the bowl after using it. A potential solution talked about was making the main stem detachable to use the stem and flaps as a spatula to scrape the rice out.

<u>Conclusion</u>:
This testing session yields important feedback on features that work in the current design, such as the agitation flaps, drainage slits, and water hole, as well as features that could potentially be

added, such as a cover for the water hole and mesh for the drainage slits. This session also produced ideas for additional variables for testing, like using different types of rice.

Limitations:

Since the user testing and feedback was over Zoom, the user could not directly interact with the mockup. The user could only watch the process so there could be concerns or dislikes about the device that she could only realize while using it herself.

Appendix K: Design Review Summary

Problem Statement
Our mission is to allow rice cookers to wash rice clean without touching the rice with their hands. We aim to make this product and associated processes as clean, time-efficient, labor conserving, compact, durable, easy to rinse and sustainable. The product needs to wash 1-3 cups of rice per wash.

User
Susie Kelly is a middle-aged woman, who has been cooking rice for 40+ years. She washes rice at least twice a week, but she doesn't like getting her hands wet during the rice washing process.

Design Requirement
- Clean rice thoroughly
- Time efficient
- Durable
- Compact
- The device is easy to rinse between uses
- Holds 1-3 cups of rice
- Sustainable

Testing results:
Table 11 shows a summary of the design review results

Table 11: Summary of the design review results

Reviewers like	Reviewers dislike	Features to be added/modified	Additional Comments
<u>DESIGN: FLAPS</u> Provide good agitation to the rice <u>DESIGN: BOWL</u> Can see the water color clearly through the bowl Good size bowl for any amount of rice	<u>RICE STICKING TO SIDE</u> You need a spoon to transfer the rice sticking to the side of the bowl into a rice cooker <u>EASE OF USE</u> Crank is heavy and rips the duct tape away from the stem to the	Connection point between stem and crank Mesh to drainage slits	<u>3D Printer</u> Materials that were suggested were ABS and PTG, which are both sturdy materials <u>FLAPS</u> Consider putting multiple flaps so it acts as fingers

	crank		<u>WATER CONSERVATION</u> Lines to show how much water to use could save the user from using extra water Rice water is good for plants and hair

How We Will Address This Feedback:
From the feedback we received from the design review, we discussed the feedback we wanted to implement and brainstormed ways to implement it.

We have decided to add food-safe mesh to the drainage slits in order to stop any rice from falling while switching the water out. Additionally, we need to test different shapes and materials for the flaps and see which one agitates the rice the best and which is the easiest for the crank to turn. We also need to figure out the best way to connect the stem to the crank mechanism, which we will talk to a shop professional about. In terms of water conservation, the draining slits on the design makes it easy to keep the rice water, which the user can use for other purposes.

Appendix L: Performance Testing: Final prototype

Purpose
The purpose of the performance test was to test the usability of the final prototype. For one cup of rice, we wanted to test: (1) how much water is used, (2) how long does the device take to clean the rice, and (3) whether agitating the rice cleans better than not agitating it. Our objective was to determine how well our final prototype fit our user's requirements.

Methodology
In the first part, a team member measured 1 standard cup of rice (180mL) and placed it into the bowl along with 1 standard cup of water (240mL). Then, the team member cranked the top handle for 30 seconds at medium speed. After 30 seconds, the water was dumped into a bowl on the side so that it could be measured after the process was done. Another cup of water was added and the cranking process was repeated. We did this until the water was clear and did not change after more agitation. We rinsed the device after use. Additionally, we recorded how much water was needed to clean the rice without agitating the rice (i.e. running the water through the rice).

In the second part, in order to test whether agitating the rice cleans it better than not agitating it, a team member measured 1 standard cup of rice (180mL) and placed it into the bowl along with 1 standard cup of water (240mL). Then, the team member let the rice soak for 30 seconds. After 30 seconds, the water was dumped into a bowl on the side so that it could be measured after the process was done. This process was repeated until the water was clear. Once the water was clear, the rice was agitated slightly to test if there was still starch attached to the rice.

Results
In the first part, the rice water was clear after 4 agitation cycles of 30 seconds of moderate pace cranking. It took 5 minutes for the whole process, including switching the dirty water out for clean water. We used 4 cups of water for the entire rice washing process.

In the second part, when not agitating the water, it took 6 rinses to see the water turn clear. However, due to the fact that there was no agitation present, the rice was still dirty and starch would come off with additional agitation. This process of rinsing the rice with no agitation also took 5 minutes, but the rice still had starch on it.

Conclusion and Limitations

When our prototype was used to wash rice, our rice water ran clear with only 4 cups of water after 5 minutes. We used 1 cup less than our user's current method of washing rice (Appendix D).

When we used no agitation on the rice and let the water soak, it required 2 more rinses than when using agitation. Additionally, when using the prototype, the rice was definitively cleaner. Although the non-agitated rice ran clear after 6 rinses, when the rice was given even a little agitation (stir), considerable amounts of starch would come out into the water even after being rinsed 2 more times than when using the prototype.

In conclusion, we determined that our prototype uses approximately 1 cup less of water than our user's current method. Additionally, we made sure that agitating the rice had an effect on how much starch came out.

Appendix M: Instructions for Use

Instructions for Using The Rice Spinner
The following are the steps to follow when using the Scissor Stopper. You can wash up to 5 cups of rice using a 1-to-1 ratio of rice and water.

Steps for washing rice

1. Take lid off.

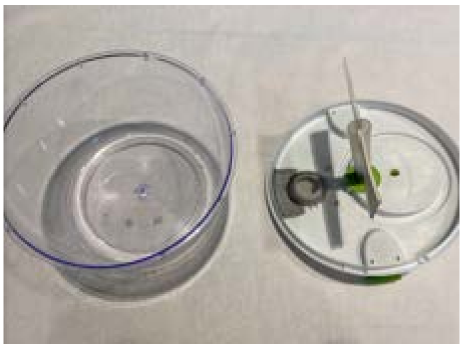

Figure 42: Rice spinner with lid off

2. Add one part rice in the bowl.

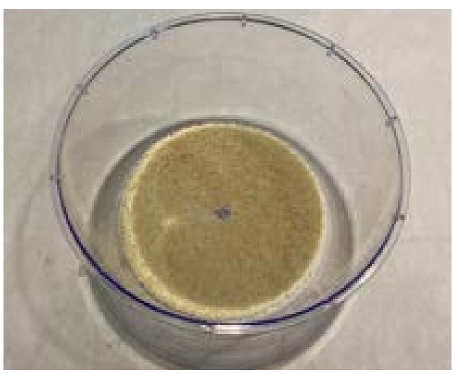

Figure 43: Rice in bowl.

3. Pour one part water in the bowl

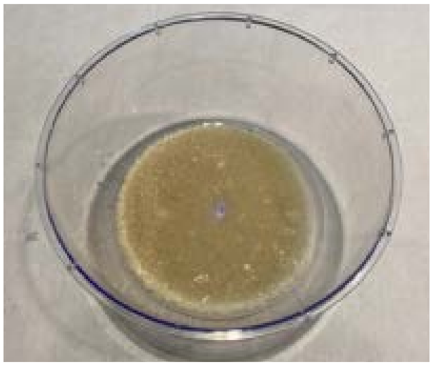

Figure 44 : Equal parts of rice and water in bowl

4. Put the lid back on.

Figure 45: Rice spinner with rice and water inside

5. Crank for 30 seconds. Make sure you put one hand on the cover flap.

Figure 46: Cranking the rice spinner

6. Drain the water from the hole on the tap.

Figure 47: Water draining out of the rice spinner

7. Put another cup of water through the same hole.

Figure 48: Drainage slits and water hole

8. Repeat the process from step 5 to 6, three or four more times until the rice water is mostly clear (Figure 49).

Figure 49: Water indicator of clean rice

9. Pour the rice into your cooking vessel. Use a spatula to get rice stuck to the sides of the bowl.

Steps for cleaning the device

1. Take the lid off
2. Rinse bowl for 30 seconds under water
3. Unscrew stem from thread on lid
4. Rinse the lid. Make sure to clean the silicone cover flap and mesh.
5. Remove the agitator flap from the stem.
6. Rinse the agitator flap.
7. Rinse the stem.