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1P03

SHEILA'S ANGELS

Summary

Problem Description

Sheila is a residence at St. Peter's Residence. St. Peter's Residence is a long-term care residence located on Redfern Avenue in Hamilton. She has a disability on her left side of her body, which will not allow her use the left side, which includes, her left hand and left leg. Sheila has trouble cutting apples that her family provides her. She uses a chef's knife with a six inch blade to cut her apples. The care takers at the residence are worried that Sheila about the chef's knife that is always in her room. Sheila needs a device that is easy for her to clean, which uses less force, and easy for her to cut her apples.

Design

This design that was constructed met, the objectives and constraints that were given to the group, or which ones the group has thought of. The device is designed so that Sheila can take a simple task in her life, and make it easier. The design has features such as having a slope, which will help reduce force needed to cut the apple. The design also, allows the user to pull of the lever to a point they are comfortable with, therefore the lever is attached by a rod. The design is made thus Sheila can cut apples, in a safe and easy way.

Functionality

This device is constructed for the ease of an everyday activity, which is to cut an apple. It helps ease the force for users using the device, versus using a regular apple cutter. This device also make the task of cutting an apple easy.

Materials

The materials used for this project include, wood, nails, rods, and steal which is the apple cutter. The materials are picked due to their properties. Each materials are chosen either due to it long lasting life, or whether is it easy to clean. Wood and steal was a good choice for this project because these materials are known to have a long lasting life. These materials will help keep the device clean and last longer, therefore user will not have to replace the device in a short period of time.

Components and Assembly

The device is cut up into different pieces, which had to be assembled together. The device had eight pieces which has to be put together, which included the base, the apple cutter, the lever, and other small pieces that supports the device. The assembly was done my nails and bulky glue. Most pieces were put together with nails, and the lever was attached by a rod, therefore it can rotate.

Cost

Cost was one of the constraints in the project. The constraint included the price which each group member had to pay. The objective was to use very little of it. The cost included the the price of the materials only, this is because the labour was done by connections the groups member have. Which let us cut on a lot of cut of labour we had to pay if we used commercial stores such as Home Depot and Canadian Tire.

User Acceptance

First the user must put a dish/bowl underneath the apple cutting device. Once the user has found an apple to cut, they lift the lever and place the apple on the blades, they must press it down gently so it is static on the blades. After the apple is placed, the user must take the lever and press it against the apple, this will cause the apple to go through the blade, which will cut the apple in pieces. The pieces will fall through on the dish/bowl the user has placed under the device.

Benefits

The benefits of this product is mainly for Sheila and other users that need a device that reduces the force of cutting an apple. The benefits for Sheila include, having her to use minimal force, therefore it task will not give her pain. Another benefit she has is that the task is safer than having too use two different knives to cut an apple, especially with one hand.

Introduction

1.1 Background Information

The client our firm has chosen to aid is Sheila. This is an elderly resident of the St. Peters Residence. Unfortunately Sheila had experienced a stroke that had left her with limited mobility in the left side of her body, meaning her left leg and left arm are no longer able to complete most daily tasks and need support. Sheila often wears an arm and a leg splint to support the weakened limbs. When she walks the splint supports her leg to facilitate walking. Sheila also wears her arm splint sometimes to stabilize, support and keep her arm in place while she does everyday activities. She does not like to keep the splints on for long period of time as they tire her out as well as she avoids wearing both splints simultaneously as they impede her general comfort. Sheila values her independence very much in that she tries to remain as independent as possible in as many aspects in her life as she can. A particular activity in which she asserts her independence is cutting her own apples.

1.2 Refined Problem Statement

Sheila cuts her own apples with two knives and a cutting board. Since she does not have the appropriate mobility in her left hand to stabilize the apple that is being cut, there is very little that is keeping the apple in place while it is being cut. Although Sheila has had no issues cutting her apples this way, the St. Peters community believes that this method is a safety hazard and that an alternative

should be sought after. The main issues with the way she cuts her apples now are the following: Although Sheila has not injured herself in the process of cutting apples, the method with which she achieves this is flawed and unsafe. The other problem with this is that there is no safe place to keep her knives. Her primary knife being relatively large, it is exceedingly difficult to safely store these items since they are not intended in such home. Commercial apple cutters that are simple to use and pose no such threat have been proposed to Sheila, but as a result of her disability, she cannot exert enough force to properly cut the apples with the device. The commercial apple cutter that Sheila had attempted to use was a design consisting in multiple radial blades joined together at an apple core remover to create a circular design. This product requires both hands to push the cutter down on the apple in order to cut the apple. Sheila only being able to use her right arm for this, was not able to effectively cut the apple. Finally, the last but not the least significant aspect of the cutting of her apples is the sticker. Sheila no longer possesses the finesse and accuracy needed to remove the sticker off of her apple using her fingers alone, and so she achieves this using the second, smaller knife to cut a wedge in the apple, thus removing the sticker. Other commercial apple cutters that only require the use of one hand and that are practical in her setting are simply non-existent and this is why a design for a product that would fit all of her needs is essential. Such a design would let her maintain her level of independence while maintaining the safe and hazard free environment of the St. Peters Residence.

1.3 Objectives and Constraints

An objective is a feature or a behavior that the design should have or exhibit, and constraints are a limit or restriction on the design behaviors or attributes. [4] The objectives were discussed as a group according to appendix L. Our four main objectives were decided to be the ease of use, safe, minimal force and easy to construct. Under each of these there are other constraint that are present, which can be seen in appendix L. We thought these were our main objectives for this project due to different reasons. Easy to use is one of our objectives, this is one of our important constraints. Sheila is paralyzed on her left side of her body, due to that she is not able to use her left arm and leg affectively. If the device is made thus it is easy it too, it will meet the constraints of the project. The device will be quick, the device will also will have minimal steps to complete the task. These are important because it will make the job of cutting an apple easier for Sheila.

Another objective that was disused was having the device safe. We believe this is a very important aspect of the device. If the device is not safe for the owner to use, then there is not point of having a device that can harm you. Making this device safe means having sustainable materials used for, such as wood that is non-toxic [1]. Under this objective, it also means that the device should be free standing in order to be safe, this lets the user have focus on cutting the apple, instead of hold the device and having to cut the apple. In Sheila's case she would have not been able to hold the device and cut the apple simultaneously. Therefore this was a constraint that had to be met.

Thirdly, Minimal force was another important objective to this project. Sheila is paralyzed on her left side of her body, as mentioned above. Due to this she is not able to use a lot of force to cut an apple, with an apple cutter. If the device that was constructed had minimal force required, it would make the job for Sheila easier, tying this with the objective of ease of use. This objective will give less stress on Sheila, because it won't cause her pain while conducting this task, which will help make her happy.

One of our last, and least important objective was to make a device that is inexpensive. This was the least important because this objective did not have a connection to Sheila. This objective was mainly for the group and the budget of the project. After the group discussed about this objective, we determined that this also has an effect on the user. The user is the one buying the product for use, therefore the cost of product in total would be more than the construction cost for the group/company. This is because the user will pay for labour and the materials that are used and in the end it will cost more for the user.

1.4 Prior Art Commercial Products

As mentioned briefly in the 1.1 Cutting Apples section, there are currently no existing products that are suitable for Sheila to facilitate her apple cutting. There are, however, existing apple cutting devices that are suitable for the general public to use. The general design of these apple cutters has been optimized and patented and the vast majority of commercial apple cutters follow the same design. This design consists of radial blades converging at a circular blade in the center of the object and the outer casing containing the blades and providing two handles. The design is meant to be used with both hands to push down vertically on the apple. The radial blades cut the apple into slices while the circular blade removes the core of the apple. This design does not accommodate the removal of the sticker on the apple, there are no current products that do this exclusively as it is a very insignificant task. Although there aren't any currently available commercial products that Sheila can use to cut apples, there are apple peelers that Sheila can use independently as some exist as stationary platforms with a crank that only requires one hand to operate. An example of an existing apple cutting device is the Freshware Apple Cutter, KT-430 [2]. This device is a generic example of the design previously outlined. Produced by Freshware this product is sold at \$7.99 at Walmart and most other supermarkets as well as kitchen appliance stores. The product has eight radial blades to produce eight slices of apple, a circular blade to remove the core of the apple and two handles to grip the product.

As mentioned earlier, since the design for home-use apple cutters has been optimized and has been accepted as the most efficient, many products will be nearly identical in their design, shape and aesthetics. The only real variations between these products are the materials used to create them, and the number of radial blades in the product. The more blades there are, the more slices will be produced and subsequently the slices will be smaller. Amco Houseworks Dial A Slice Apple Slicer is an apple cutting device with the same design as others, with the exception of the "dial a slice" feature which allows the user to alter the amount of blades (8 or 16) and therefore altering the size and amount of slices [2]. There are also other complex apple cutters like the Choice Cast-Aluminum Apple Slicer, which can be bought online, this product function by adding the apple on the end of a rod, and then spinning lever, which will cause the blade to cut the apple and also peel it. [3]

Patents: Since we are incorporating a commercial apple cutter into our design, it is important to treat the patents behind the original apple cutting device used. The first ever patent made for the design of an apple cutter patented 2 blades crisscrossing each other with no frame and a single handle at the top, with a center blade to remove the core, effectively cutting the apple into four slices and removing the core (1910). The next patent for such product patented the radial blades converging into the circular blade that removed the core of the apple. The publication date is August the 28th, 1923. The inventor was Robert Buchi. This design also featured fourteen blades that would cut the apple and two handles at

the top of the frame to increase the stability during the cutting process. The patent number for this invention is US1466114 A. [5]

Conceptual Design

2.1 Brainstorming

This morphological chart shows the different functions and means that can be used for the project. [4] [Appendices D] A morphological chart is a chart that states means for each of your objective. This stage was more of the brainstorming stage. During the tutorial 8, as a group we came up of different options of materials we could use to make our device. For the function of lowering a handle to cut an apple, we said that we can use a pulley, hand, rotate gear, and elbow. These were good ideas at the brain storming stage, because after analyzing the objects each mean we picked a reliable material. Another function we discussed was how to get the apple to stay in place, the ideas the group came up with was pins, clamp, bowl, and tube. These would have been good alternatives if the apple did not stay static on our device. Our third function was capturing the apple after it was cut, a bin, dish, and bags were some ideas we came up with. A Bin and a dish were the better option in terms of cleaning and sustainability. One our main functions was to reduce the force Shelia needed to cut the apple. We came up with a leaver, which would come in the concept of torque and it would reduce force easily. Lubricate Joints, sharper blades and comfortable grips. One of these would have been a great way to solve the problem, but for our device the lever was the best solution. Another main objective about the device was to keep it sanitary and clean, ways to do that, would have been to have detectable parts which were easier to clean, having very less detail on the device itself, therefore it was stay more cleaner, using metal or plastic therefore it is easy to clean.

2.2 Design Alternatives

2.2.1 Preliminary Alternatives

Referring to appendices E and G. This was our alternative, one of the design we as a group decided in tutorial 8. This design meet most of our constraints and objectives. We though this device would be a great idea because Sheila was unable to apply force with her hand to use an apple cutter, but the force from her foot would have been greater than the force she applied with her hand. The design was made, from an idea of a garbage can, that can we opened by foot. Using that mechanism, we could have applied that to cutting an apple easily. The way this mechanism works is that, when you press your foot on the paddle on the bottom, it lowers the apple cutter, and cuts the apple. The apple is going to be placed on the board under the apple cutter, therefore it is easy to keep track of the apple and easier to keep the apple in place. Therefore the primary goal was meet with this device. When the peddle is pushed the rode that is connected to the apple cutter would be lowered, then the apple cutter that was connected to the rode would also be lowered. That motion would cut the apple. The materials that were going to be used for this was metal for the rode connected to the paddle and for the paddle itself. The apple cutter was going to be out of steal therefore it could last longer and would be easy to clean. To place the apple, we were going to use a wooden board that the apple could be cut on. The wooden board and the apple cutter would be detectable, for cleaning purposes. These materials are not expensive do get at a hardware store, therefore it would have been an inexpensive device.

Objectives were completely met for this alternative, because in the end the device cut apples, with less force required to cut an apple with a simple apple cutter. The device used materials that would have lasted long, and which were sustainable. Also it met the objective of having the cost low.

2.2.2 Secondary Alternatives

We chose to focus on Sheila's difficulty of cutting an apple. Sheila uses two knives daily to cut her apples. We thought that we should put our time into making an activity for her and others safer, and enjoyable. First we thought that not only can Sheila use this, but other people that have trouble cutting apple, due to disability, or any other person would have a chance to cut apple in a safe environment. At the long term care home, the staff wants the residences to feel independent with the activities they do. Another reason why our group choose to do the apple cutter is because with this device, Sheila will feel independence at her long term care facility. Moreover, the use of a knife for Sheila is dangerous, this device would make this task for Sheila harmless. This would also relive stress on the caretaker at the long term care home, because when Sheila has this device she will not need to have passion of knives in her room.

Referring to Appendices F, on the right of the paper, for the following. Another alternative we had disused was having a similar device has our apple cutter that we built. For this alternative, we put together different ways to put our model together. Whether it was changing the angle or having the size changed. There were many things we altered on the design. This alternative, is very similar to our current device because the only different it has with our made device is the change of an angle and having the apple cutter removable for cleaning purposes. This was one of the first designs we thought of. This design was not very efficient than our current design. This design works the same as our current design, where you push the handle done and the apple gets cut and falls through. The angle was the main issue about this design, because the handle was pressed down, only on side of the apple would have more applied force then the other side, making it harder to push the apple through the cutter. The angle on the new design helps the apple be parallel to the handle that pushes it down, therefore the whole apple can have equal force applied to it. The materials needed for this alternative would have been a steal apple cutter, and wood. These materials made it inexpensive, and easy to clean. The alternative design was an idea that would have worked, but it would have worked with more force needed to cut the apple. The force needed to cut an apple with this alternative, could have been hard for Sheila do apply.

2.3 Design Evaluation

A metric is a standard measurement, in content of engineering design, a scale on which the achievement of a design objectives can be measured. [4] Each objective has a metric corresponding with it. Referring to the metrics chart in appendices H. The most of these metrics were met in the product we have constructed. Our first objective was, for the object to be free standing the metric corresponding with it was to have a high coefficient of friction. This was met by having the objet big enough to hold its own weight and stand freely, which our project does. Another objective we had was minimal force required to cut an apple, the metric with this objective was to use only one hand to cut the apple. This was met by the long application lever, the long lever decreases the force on cutting the apple. Which will make it easier for Sheila to cut her apple. Inexpensive was another objective we had, this metric was meet because the total cost of our project was \$36.32. Which comes to a total of \$7.30 per person. Lastly, last metric was having it las t a long period of time. The product is made out of wood, and the

apple cutter is out of steel. These materials have a long tendency of lasting with a lot of force applied to it.

These metrics were used to decide on which one of the designs we choose to make, appendix G. This design was using force from the foot to cut the apple. Most of the metrics were following this design plan such as requiring minimal force, because the force would decrease because Sheila was using her foot, which can apply more force than her arm. Another metric that was met with this design was free standing, the device would support its own weight, which would make it stand, and the idea was to add grippers to the bottom of the device, which would cause it to stay in place. It would have also been a soft surface, and non-hazardous device, because the only application needed it the press of the foot. Therefore there would have been no hazardous situation with this device. This device was not chosen because it not met some of our other metrics such as, portable, and inexpensive. The device could be not portable because it was made for one length, which meant that only certain sizes of tables could have been used with the device. Therefore that was a constraint that was fixable. Also the cost of that device would be a lot, because the materials needed for device was metal because other material would have been broken or chipped easily with the force applied with the foot.

Final

3.1 Description

Our project is essentially a lever-arm device with an upper level to support the apple cutter, a lower level to catch the apple and a back to support them [Appendix A]. The upper level has the apple cutter embedded within. The lever contains a wooden panel along it, aligned so that it is above the apple cutter when lowered. The upper level is built on a slant to maximize the efficiency of the cut while the lever arm is pushed or pulled down. Below the apple cutter on the upper level, the lower level contains a support for a plate, ready to catch the apple once it has been cut [Appendix A]. The lever arm can be rotated with one degree of freedom through a thin cylindrical rod inserted in a hole on the back [Appendix A]. It can be rotated to a maximum of about twenty degrees below horizontal, to fully push the apple through the cutter. The square block of wood on the lever is about $\frac{2}{5}$ the way across the arm, giving a large mechanical advantage when used.

3.2 User

Before cutting, the user slides a plate unto the lower level to catch the cut apple. The apple should be placed directly on top of the apple cutter. They then lower the arm, pushing or pulling down until the apple fully slides through the device and onto the plate.

The arm is to be left lying against the top level when not in use. The device is stable and free-standing. The device can be stored anywhere with about 30 x 15 x 20 cm (l, w, h) of space, such as closets or cabinets, or left on the table by itself without risk of hazard. Since the device is made out of wood, it is perhaps advised to avoid storage in damp areas or exposure to outside air. An optimal environment for storage would be a clean, dry cabinet which is frequently cleaned and not located above shoulder level.

The device can be cleaned by using wet paper towels or cloths. The arm can be detached for cleaning, and can be wiped down without risk of hazard. The body of the device can be wiped as usual, taking care to avoid the apple cutter blades. The apple cutter blades can be rinsed down through a sink.

The device can be carried by using one arm to hug the body of the device and the other hand on a support to push it against the body or below the base to lift it. Care should be taken while carrying, as the device may cause damage if dropped. The user should not carry the device with anything else in their hands.

3.3 Construction

Note: All length units are in cm. The body of the device requires one 23 x 14 x 2 block of wood for the back, two 30 x 14 x 2 blocks of wood for the base, two smaller 10 x 2 x 2 blocks of wood for supports, a thin metal cylinder about 10 - 15 long, and screws and glue for construction. The arm of the device requires one 50 x 5 x 2 block of wood. The device also requires a normal apple cutter blade. Note that the wood was purchased as one large board then cut appropriately, rather than buying many smaller pieces. The ability to use an electric drill, regular screwdriver and electric saw are required to build the device. These items can be purchased at many home utility shops such as Rona, Home Depot or Home Hardware, for a total cost of \$36.32. The tools can also be found at the aforementioned stores.

Before cutting, outlines were traced onto the large board with a pencil to mark where to cut. Following these outlines, the wood was cut into the corresponding sized shapes using an electrical saw and the circles were created by drilling along the circumference. The holes in the back for connecting the thin cylindrical rod of the arm to the body were also made with a very thin drill. Altogether, this can take about one and a half hours, with the most time spent on drilling holes to create circles.

Once the components of the device were in the right shape, the device was assembled using a combination of screws and glue. Connecting the large pieces such as the wood base/back was done by screws, while glue was used for minor parts or reinforcements on the device such as the supports. The apple cutter also has to be inserted. This takes about half an hour to 45 minutes, with the exact procedure described below.

First, the base and the back were screwed together, forming an L-shape. The supports were then screwed and glued to the other end of the base. Next, the apple cutter was inserted by drilling it into the hole on the upper level, then the upper level was screwed in with the base and supports. Finally, the back and the arm were drilled and the metal rod was inserted into them, allowing for a fully functional lever arm.

3.4 Safety

Safety being the initial concern with Sheila's apple cutting process, it is essential that the design gets rid of the hazards associated with Sheila's original method. The entire design is fabricated to minimize any risk of injury. An essential step to achieving this was to keep the blades stationary during the cutting motion. This is to say that when the lever moves to slice the apples, the lever simply pushes the apple through the blades therefore eliminating the potential risk that mobile blades present. The handle is also intended to be gripped at such a distance from the blades, that achieving accidental self-

injury is physically impossible. When the cutting process is complete, the apple slices drop into a bowl placed below and may be safely removed afterwards. There is no risk of self-injury during the apple removing process as the sharp ends of the blades are pointing upwards, and because there is a considerable distance present as well. When the device is being stored, the natural position of the handle covers the blades and therefore eliminates the risk of accidental injuries. Since the handle of the design is made of untreated, the risk of splinters is present. To prevent this hazard a grip was made for the handle to make for comfortable and safe use. The slipping of the device during the cutting process is a safety hazard for multiple reasons and this is why the base of the device was made to be slip resistant by adding a padding/adhesive material that has a high coefficient of static friction to resist slipping. In terms of hygiene, the design intended for a removable blade which may easily then be washed and placed back inside the device.

3.5 Description of Prototype

In building the prototype, there were many ideas that changed from the design alternatives. Some simply could not be implemented.

A suitable sawtooth addition [appendix C, middle picture] could not be found for the blade of the cutter. Instead, a regular apple cutter was used for the device's blade. The blade did not actually require any reinforcements to be embedded in the device; due to the arms on the purchased regular apple cutter [appendix N], the blade was held in place simply by sliding it in deeply into the wooden hole. The handle could not be effectively made with the bend on the end of the arm [appendix C, top picture]. Instead, it was made longer to accommodate a sliding grip; the client does not need to have her hand restricted to one spot while moving the device downward. The device was also reduced in size and weight again without repercussion.

Although most changes were due to constraints in practical construction, some were also made because of perceived benefit for the client. For example, the nail in the arm was made to be removable as to allow the arm to be detachable, which is advantageous for cleaning. This was not in the original or updated design alternatives. Through trial and error, small changes were also made to the shape when applicable (such as testing which angle was best) to maximize ease of use.

3.6 Discussion of Feedback from Design Reviews

During tutorial 9, 10, 11 the group got feedback on our device, the first time we receive feedback is on the device in appendix I. The feedback chart is in Appendix M. The device was made out of cardboard, and small house hold items, for the students from the faculty of Biology and social science, which were helping us give feedback on our device to visualize the device. During this design review session, we got feedback on our first prototype. The design reviewers said to reduce the device, so it is able to transport to where ever it's needed. The bowl that was attached to it, for that part, they told us to remove it, because that causes unnecessary material to the device, and every household would have a bowl/dish they can have under the apple cutter to caught the apple. From this feedback we improved our design, which is appendix A.

From the second round of feedback, we received good feedback to improve our project. After presenting our product, the student gave feedback in terms of have the device smaller, and having the weight reduced in terms of the materials we were going to use. The students also mentioned that it would be easy for Sheila to use the device if the apple cutter was removable therefore it would be safer for her to clean the apple cutter. They also mentioned that the device should be more portable, if the device was portable, Sheila could take it with her when she needs it outside the room. Lastly, they said to use materials that are sustainable, and easy to maintain and clean.

From that feedback from the design reviewers, we improved our device, and made the apple cutter removable, which will make it easy for Sheila to clean the device. With that improvement, the placement of the apple cutter was changed, there was a slot added slot added to the device that the apple cutter can slide into and out of it. Another improvement we made from the feedback was make the device more condense, in this cause it is easier for Sheila to transport if need be.

The last source of feedback we received was during tutorial 11. The group presented the with a final design prototype [appendix B]. The feed that was received during this time was important for our main presentation during tutorial 12. Overall the group presented well, with miner problem or pausing, thinking for long, and have flow to the presentation. That was cleared up with practice for tutorial 12's presentation.

Conclusion

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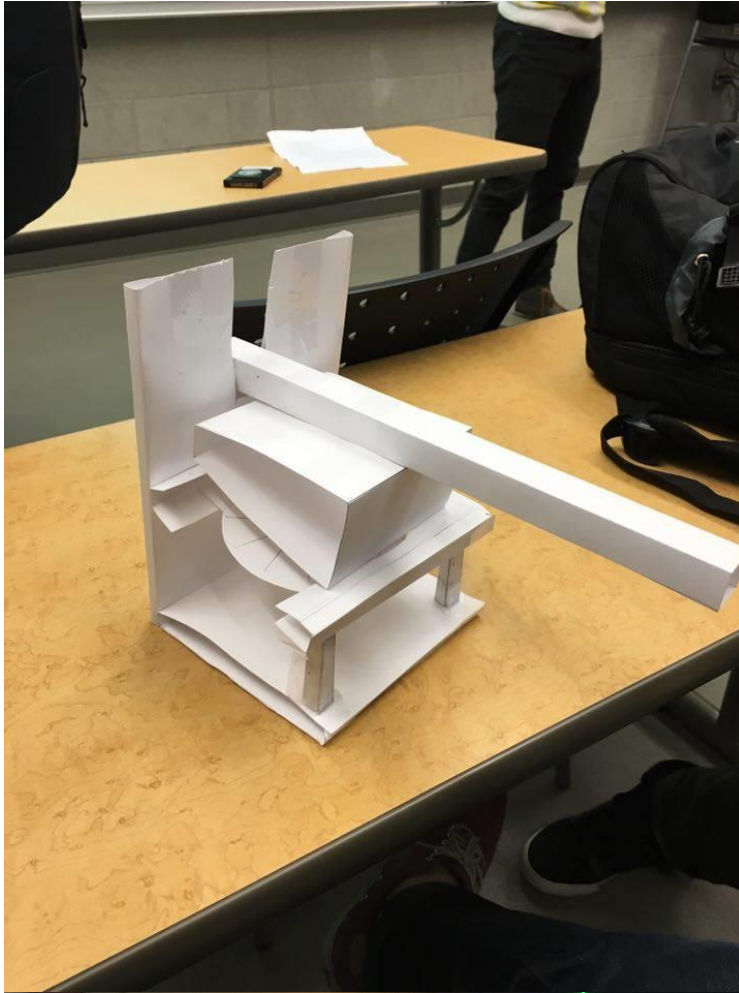
[7]Unknown Author (unknown year). Moment of Inertia (1st ed). [Online]. Available: http://www.engineeringtoolbox.com/moment-inertia-torque-d_913.html

Appendix

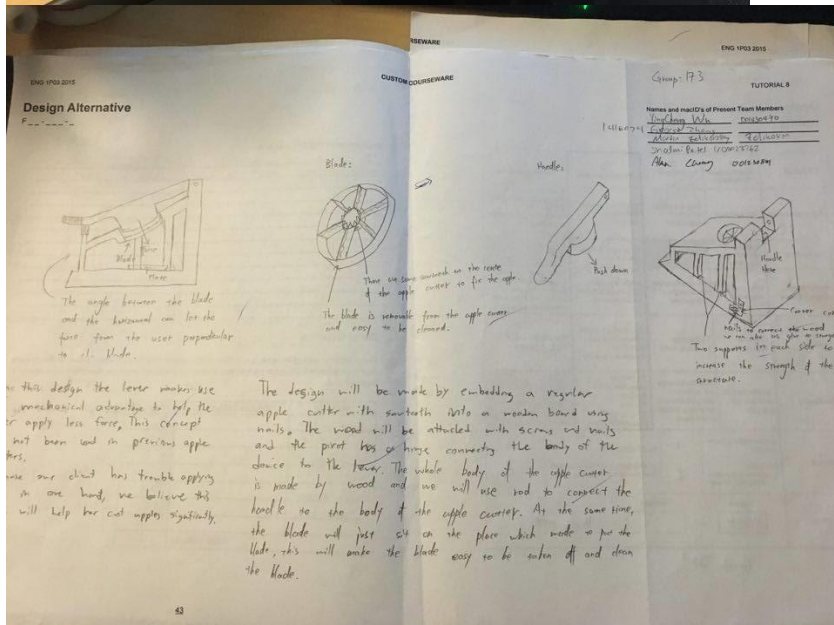
A



B



C



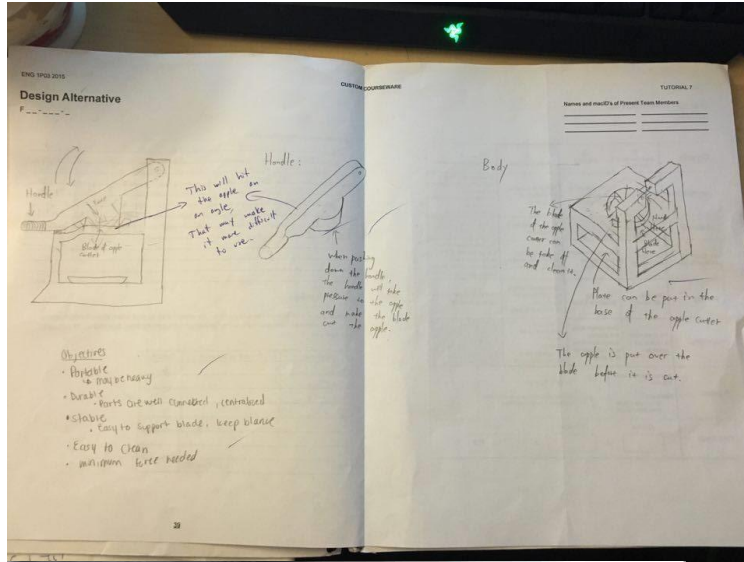
Functions	Design Alternatives			
	Means			
Lower Handle	Hand	Pulley	Rotate Gear	Elbow rest to push down
Hold Apple in place	Pin	Clamp	stoped Bowl ①	Tube
Capture cut apple	Bin	Disks	Bags	
Reduce force applied	Lever	Lubricate Joints	sharper Blades	Move apple closer to lower point (reduce torque)
Keep Sanitary	Detachable Parts	No small Cavings	Use metal/Plastic if possible ②	Coat surface with water resistant glass
Stabalize Device	Table Clamp	Balanced Distribution of mass	High friction mat	Add Weights
Connect Parts of Device together	Nails	Tape	Glue	Screw Magnets

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1416074

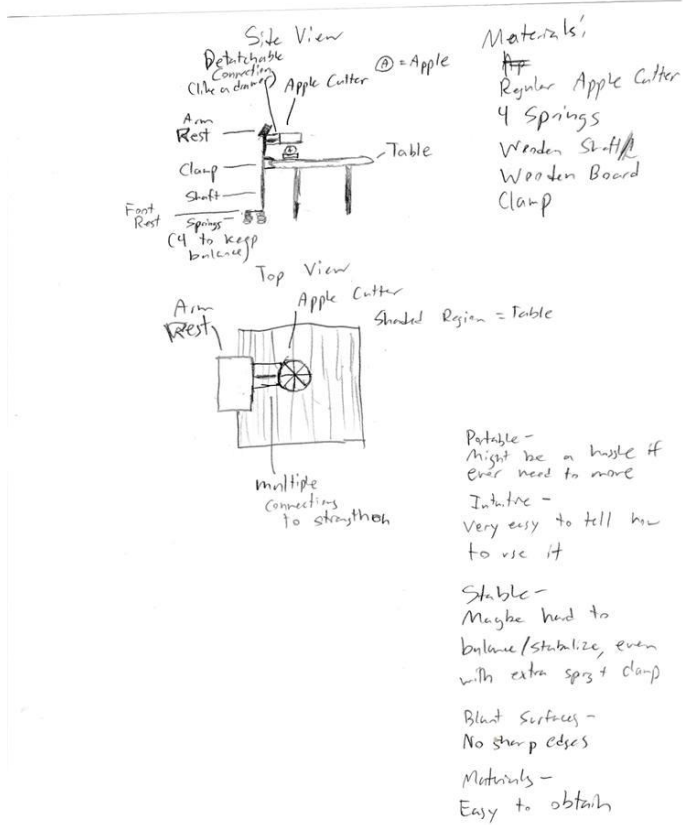
①: Apple sits at bottom, unable to move
②: Less prone to bacteria than wood

[illegible]

F



G



H

Objective: Free standing/static | Metric: Difficult to knock over,
High coefficient of friction

Metric:

Objective: Blunt surfaces | Metric: No sharp extrusions, cannot ~~injure~~ ^{injure} yourself
accidentally/easily.

Metric:

Objective: Minimal Force | Metric: Can be used with one arm and/or
other limbs.

Metric:

Objective: inexpensive

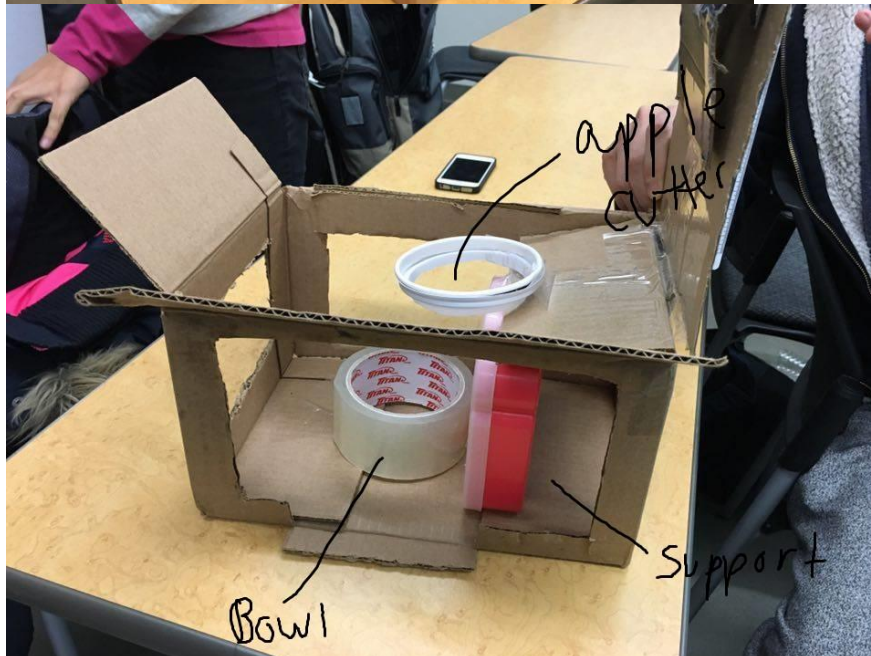
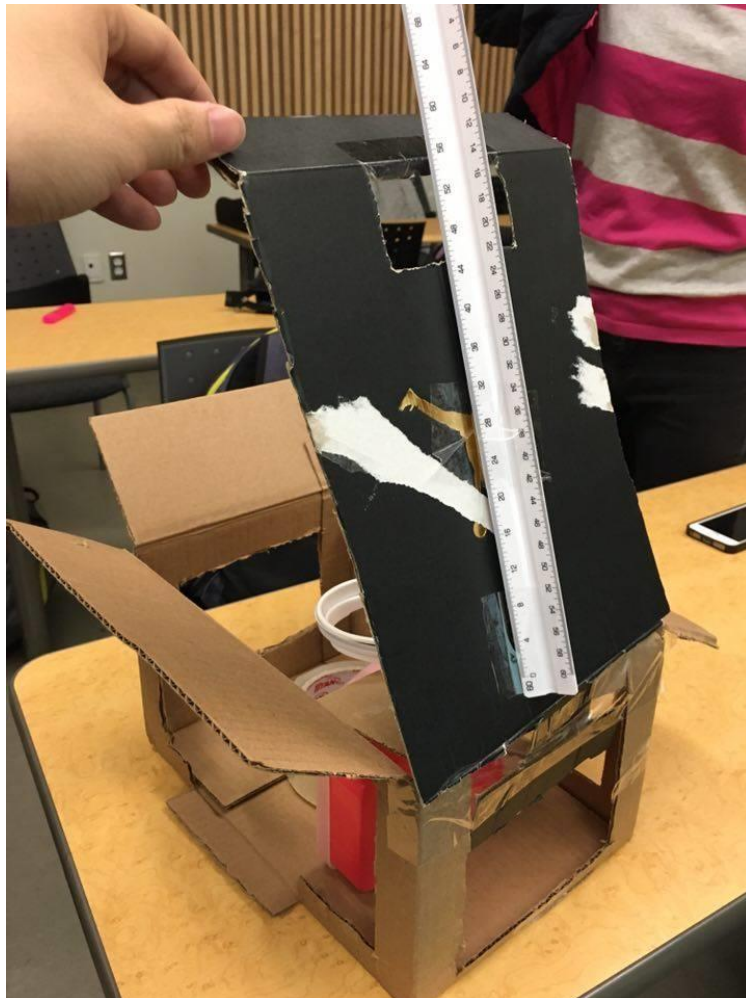
Metric: \$20 a design team member.

Objective: Portable | Metric: Possible to be carried with one hand.

Metric: ^{↳ do not evaluate your objectives}
simply with yes or no.

Objective: Durable | Metric: Can withstand continued contact and use or ^{constraint,}
last long time, non-reactive with chemicals in apple

Metric: needs scalp



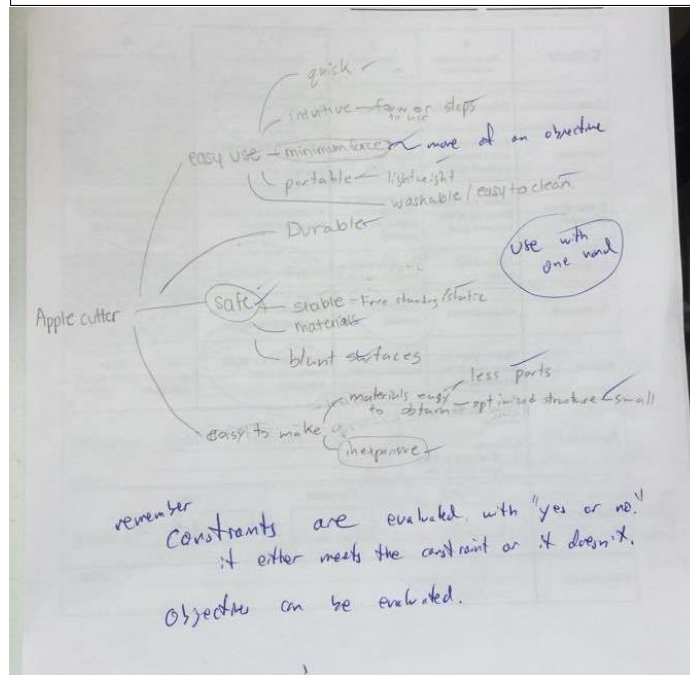
J

K

L

Item	Cost
Wood	\$17.99
Nails	\$2.59
Corner	\$0.75
Apple cutter	\$14.99
Total	\$36.32

Objective	Metric
Free standing //static	Difficult to knock over, high coefficient of friction
Soft surfaces	No sharp extrusions, cannot injure yourself accidentally/easily
Minimal force	Object being used with one arm and/or other limbs
Inexpensive	\$20 per design team member
Portable	Less than 2kg
Durable	Object can withstand continuous content(force), and/or long lasting, and nonreactive with chemical in apple



M

Review session #1 (tutorial 9)	Review session #2 (tutorial 10)	Presentation feedback(tutorial 11)
<ul style="list-style-type: none"> - Smaller device - Reduce extra space - Detachable bowl - Lever with support therefore it is easy to hold - Blades need more support 	<ul style="list-style-type: none"> -reduce extra area -try making it smaller -have grips at the bottom to hold device in place -handle needs a soft grip for holding the device comfortably 	<ul style="list-style-type: none"> -clear voice - The group should flow together -talk louder - no "um" and "ah"

N



Reflections

Shalmi Patel

Shalmi Patel

Student number: 400023762

Student ID-patels19

There are many different ways to approach different problems. Our project was to create an apple cutter for Sheila. Who is paralyzed on her left side, which makes it hard for her to use an apple cutter. Therefore she uses hazardous knives. There are many different products in the market already for apple cutters, but we needed to make a device that made it easier of Sheila to cut an apple herself, independently. When we started the project, the ideas we came up with did not seem like a good solution to our problem. Throughout the group meetings and tutorials the group came up with various ideas, and designs. Some of the ideas were harder to put together then others.

After the group visited different stores we discussed what are good materials for this project. With the ideas in our head, we decided on two different designs for the apple cutter, one which involved using the force of a foot to cut an apple, and one which uses force from one hand to cut the apple. We chose to go with the design that uses the hand. We chose this design because it was easier to have a device that is portable and easier to clean.

After getting feedback from our TA, we improved our design. By making the improvements that the TA suggested we moved along with the project. With the given feedback, we applied it to our project made it that it fit our objectives and constraints better. After that we stuck to our design and made it better, in terms of different feedback, from each other in the group.

There could have been a lot of stuff that we could have done differently, such as has different material, instead of using wood, or having a better handle so it is easier for Sheila to use. Other things that we could improve on is reducing the size of the device and making it easier to clean. The size of the device is bigger than imagined for the group, but the primary object for the group was to make it function, which in the end it did. There was a debate on how to make the device easy to clean, if we should have more detachable parts, or is it easier to have the device one piece and only have the apple cutter detachable.

In the end the group decided on the design and came together and solved a problem for Sheila. This was a different learning experience, which taught us different things, about engineering and in general “thinking outside the box”.

Martin Zelikovsky

The opportunity to design and create a product that would contribute to another human being, is truly the first step I've taken into the field of engineering. For the first time, practicality and intent has been incorporated into a project. Beginning with a simple brainstorm of ideas to aid a disabled woman maintain her sense of independence and ending with a functioning product that achieves the intended goal is extraordinary. Having picked Sheila as our client our team got to create many concepts and test many prototypes to see which ideas would surpass others in terms of effectiveness, practicality and functionality. What was particularly interesting about this project is that teamwork was required. Unlike many schoolwork assignments which are done individually, this project forced students to come together and learn how to effectively work together as a team. This is very reflective of what the real life engineering field looks like; engineers often work in teams in which they have little control over the composition of the team itself. This teaches students to work effectively with various students and become flexible and dynamic when placed in groups. This is also significant because it is very clear in today's society that it is fairly difficult to create something very powerful in lone numbers. What the field of engineering has always strived towards was unified teamwork that would empower the potential of every individual member. What this experience has also taught us is the designing process as this is an unfamiliar process for most. What it has taught us is that there is no such thing as a bad idea and that all possible directions and approaches should be at least contemplated before being disregarded. A defined problem statement will set the goal towards which the group member will strive, but metrics and constraints will set boundaries to ideas and concepts in terms of practicality and the interests of the client. The designing process calls for many prototypes to physically see, touch, and feel the preliminary manifestation of ideas and concepts. Building multiple prototypes allows for amelioration of approaches and optimization of current structures. They also allow the designers to see

the physical limitations of a concept or an idea and the practicality of an idea. Through several prototypes a final design is achieved, something that meets the objectives as well as the constraints and has been tested and optimized through prototypes and trials. All in all, this project gives a glimpse of what it is like to truly work in the field and to envision, create, test and finally optimize the design and create a product that bears the contribution of many teammates just as it is in the real world.

Kevin Wu

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From this project, we are designing an advanced apple cutter for Sheila to let her can cut an apple easily. From the information we got from lectures and tutorials, we learn that Sheila's hand is not that powerful to use a normal apple cutter effectively, therefore, we were going to design an apple cutter which can minimize the input force required to cut the apple. During the design process, we found that there were many ways to reach our goal, but it was hard to find out a best way to solve the problem, at the same time, the function and metric helped us a lot in this project. At the beginning of the design, we tried various designs, for example, on of our designs use worm and worm gears to minimize the force required for the user, one of our design tried to use lever to decrease the force required for the user. At that time, it was hard for us to determine which design were we going to use, because both of them would work and reach Sheila's requirement. Therefore, we used an objective tree to list the constrains and the objectives we meet in this project, then we found the design uses the worm and worm gear was not easy to make and will cost more compare to the design which uses lever. In this case, this part let me know that an objective tree can make us what we can and should do in a design in order to reach the client's requirement and minimize the cost of our product. When our first prototype of apple cutter was completed in our project, the adviser also gave us a lot of useful advises. From the advises, we know that the size of our apple cutter should be minimized in order to let the user to move it, in addition, they also told us that the angle to apply force to the apple is important in order to cut the apple and we should use something to increase the friction between bottom and the desk to prevent the apple cutter not moving around when the client is using it. This part made us realize that we still had a lot of things we had not considered and we still had a lot of space to improve our design to best fit our client. When we were making the final model, we realize that our design was still too complicated and it was hard for us to find ways to cut the wood into the size and shape we really expected. Therefore, we meet each other and figure out the ways to solve these problems. Finally we changed some of our designed in order to make the design can really be made by the tools we have. At the same time, from the group meeting. In this case, I knew that the communication out of class was really important in order to make our design better. In conclusion, from this project, I learn that it is not easy toe design something which looks very simple, in order to meet the requirement of the client, we have to consider a lot of things and we should know what we can do and where is our limitation. At the same time, others advise is very useful to improve the design, this is because they can watch our design in different degree of views. Furthermore, the communication between group members is also very important, it can help us to know which part should each group member do.

George Zhang

George Zhang

1416074

zhanggq

Team 173

First attempts don't often result in success or satisfaction. This has been emphasized to us many times in high school, whether it was writing essays, debugging code, or even solving a math problem. Often our first impressions of a problem are too naïve, missing essential insight, or far too ambitious. Our project, which was building a prototype device to satisfy a client's special needs is of course no exception. In the beginning, we had created many designs ranging from small and simple to large and complex, with far too many interconnected parts. We had no metrics to measure how effective the designs would be. Through the tutorials we developed methods to anticipate which designs would be more effective, and we eventually settled on a less over-the-top design through group consensus and feedback from a TA. I thought this point was a great opportunity to reflect on how we changed our way of seeing things. Looking back, most of those designs were probably too ambitious or difficult to make. This was when our engineering intuitions were beginning to develop; we had some idea of what would and wouldn't work, and what we could and couldn't build. However, after receiving feedback for our first low-fidelity prototype, we realized there were many things we hadn't considered. Fulfilling the project goal was the primary task, but what about how convenient our design was for the client? The primary focus in design had been functional objectives and the main client objective of reducing the required user force, but lesser client-sided objectives such as cleaning the build, carrying it around or even taking the cut apple out hadn't been addressed. Our design was large and heavy, but we did not notice these flaws at all, since it looked like it "worked". Since the engineering profession is first and foremost dedicated to improving society, more emphasis should have been taken in looking at our design from our client's viewpoint. There were immediate changes we made to our design, like reducing the size and changing the shape, that could have been done from the start. With the later prototypes, we discussed how to improve fine details and consider materials for each part. There were many good but difficult improvements suggested between us. For example, using metal or plastic instead of wood would reduce the potential for bacterial buildup, introducing a table clamp would help stabilize the device and making every part detachable would be very client-friendly as it could allow for individual repairs, replacements or cleaning. However most of these were impossible for us to implement with our level of skill. This was an important learning experience on its own because in real world designs, we may ask why many things are simply built to a satisfactory level, but no attempt was made to improve things beyond that? There may be time, cost or ability constraints, which we will have to continue to deal with in our careers.

Alan Cheng

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Student number: 001230881

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During the project of apple cutter design. We mainly practiced on researching, planning, paper designs and building prototypes. Our user is Sheila whom has difficulties using regular apple cutters that require the use of two hands. At later stage we got insights from different individuals (students from same class or different majors, hospitality workers, IAs and professor) that guide or help us improve our designs. Different designing methods were practiced. Most importantly, it's a project that requires teamwork and cooperation and communication with different parties. During the early stage of our design, we try to look for as much as different functions and means that help us to expand our design space. After input from group members and revises, we were able to come up with 2 different designs as primary designs. One is vastly different from regular apple cutters which promote the use of leg instead of hands. However the second design which includes a push block, extended handle and stable base with blade was chosen due to advantage in portability, safety, easy of use and many other factor. Our limitations is one thing we learned during the later stages of our project. This includes time, budget, communication and previous experience. We can generate ideas that work excellent on paper but are hard to execute in reality due to above limitations. Some of our ideas were rejected by individuals that has more experience and knowledge in respective areas. We learnt that is necessary to regularly check with client, user and teammates and seek trust worthy help and sources in order to improve efficiency and performance of our final product. We also learnt that planning and proper communication with group members can better group atmosphere and help us keep working in the same direction. It also allow us to separate work in a way people can work on what they are good at or willing to do. All in all, this project has introduced me to group work, engineering design and prototype making.