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Our Bi-National Team

Our Leaders

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Robert Wallace- LFCC Director
Sawsan Ahmad Al Fawair- Khawarizmi Manager
Rachel Stange- LFCC Manager
Taylor Carhart- LFCC Journalism/ Social Media Manager
Rami Al-Faouri - Khawarizmi Journalist/ Social Media Manager
Nour Al-Hendi- Khawarizmi Marketing
Edwin Trujillo- LFCC Marketing Manager
Bradley Gaines- LFCC Research Leader
Laith Albkour- Khawarizmi Researcher 1
Aya Orabi, Rami Al- Faouri, Noor Al Hindi - Khawarizmi Researcher 2
John Ziesmer- LFCC Technology Specialist
Aya Orabi- Khawarizmi Business Plan Coordinator
Jessica Sims- LFCC Business Plan Primary Lead
Mary Harrelson- LFCC Business Plan Leader 1
Luisa Alcala - LFCC Business Plan Leader 2

Our Task Force Members

Jonathan Cilley- LFCC Research Task Force
Daniel Rioux- LFCC Research Task Force
Powell Benedict IV- LFCC Research Task Force
Hudson Cain- LFCC Research Task Force
Kristofer Miller- LFCC Marketing Task Force
Zachary Taylor- LFCC Marketing Task Force
Mario Villatoro-- LFCC Marketing Task Force
Evan McGann- LFCC Social Media Task Force
Irving Maldonado Alfaro- LFCC Technology Task Force
Brian Merino Cabrea- LFCC Technology Task Force
Dylan Miller- LFCC Technology Task Force

Our Facilitators

Dr. Melissa Stange- Facilitator
Sawsan Al-Najjar - Facilitator

Executive Summary

Agents of Change is a collaborative group of environmentally minded students in the United States of America attending Lord Fairfax Community College and students in Jordan attending Khawarizmi College, under the guidance of Dr. Melissa Stange and Sawsan Al-Najjar. Together the *Agents of Change*, set aside cultural differences to achieve a common goal of finding a sustainable solution to the issue of excessive plastic bottle waste. The solution that the Agents of Change have designed is called the *BottleBot*, it is a stationary machine that processes single use plastic bottles, in order to reduce plastic pollution for not only within the hospitality and tourism industry, but within all industries.

Pollution occurs when the natural environment cannot destroy an element without creating harm or damage to itself. The elements involved are not produced by nature, and the destroying process can vary from a few days to hundreds of years. In other words, pollution takes place when nature does not know how to decompose an element that has been brought to it in an unnatural way. Pollution must be taken seriously, as it has a negative effect on natural elements that are very important for life to exist on earth, such as water and air. Indeed, without it, or if the natural elements were present in different quantities, animals and plants could not survive.

The *Agents of Change*, believes that the *BottleBot* will create a safer environment for current and future generations. The *BottleBot* machine has a variety of market areas such as hotels, conference centers, entertainment venues, airports, schools, restaurants, convenience stores, and government facilities. The *BottleBot* encourages citizens to recycle their plastic bottles through the use of incentives. Our machine is different from others, which exist in the market, as our machine provides two design options of how to handle the plastic bottle (crushing or shredding) and the incentive application that may be either a point or cash reward system, based on the countries current recycling programs. Another difference with our *BottleBot* is that it has a solar energy, which makes it environmentally friendly and able to be outdoors. The *BottleBot* application enables anybody who uses the machine to get the points anywhere around the World where the machine is used. For example, if you live in the United States and take a tour of Jordan and use a *BottleBot* machine while in Jordan, the points earned while in Jordan will be add to your incentive account. More details about the *BottleBot* may be seen on Facebook at <https://www.facebook.com/groups/351975695602602/>.

Through a SWOT analysis we learned that *BottleBot* may not be well received in locations without plastic recyclers, there may be a risk of limited incentive sponsorship due to franchise rules, and existing competitors. However, offering a green solution, education, and an adaptive base product is important to potential sponsors. Our initial marketing survey showed that, *BottleBot* would be welcomed by different income levels and within multiple generations. The financing for both *BottleBot* and application development will come from investors and entrepreneurs interested in supporting sustainable solutions. Additional financing will come from the one-time fee purchasers of *BottleBot* will pay. Just as adaptability sets *BottleBot* apart from competitors, so does globalization.

Providing a convenient and environmentally friendly way to recycle plastic bottles is only one part of our solution. Educating others on the topic of plastic waste is very important to the *Agents of Change*. Many people do not realize the impact plastic has on the economy, society, and environment. The *Agents of Change* are global educators through the use of social media. We have created a Facebook page, <http://www.facebook.com/AgentsOfChange>, to provide continuous education. As many new laws, inventions, and regulations are being presented, it is proven that the time for change is now.

Our Bi-National Team Mission Statement is: ***Give Back, Get Back***

The *Agents of Change* mission is to give back to our planet by maintaining a healthy environment through the awareness of our behavior towards Mother Earth. This will be achieved by reducing the number of plastic bottles thrown away via "*BottleBot*" and to encourage a healthy Earth mindset for future generations. The key to

our success is marketing, education, and implementation of *BottleBot* so that everyone may enjoy travel around the globe.

Problem Summary

The sustainability issue that *Agents of Change* is trying to solve is reducing the amount of plastic bottle waste that is placed in the environment and also aiding in the effort to increase the amount of recycling that is done. Although Amman, Jordan and Middletown, Virginia differ in both size, population, and culture; plastic waste continues to be a common problem in both locations.

Since the start of producing and using plastic commercially in 1950, about 280 million tons of plastic are produced annually worldwide. Since then, plastic has become one of the most used products in our daily life, because it is lightweight, durable, cheap, and a good insulator (Geyer, 2017). However, plastic usage has had a negative impact on wildlife, humans, and nature. About 8,300 million metric tons of plastic were produced in 2017 and this number is increasing rapidly (Geyer, 2017). According to scientists, if we do not find sustainable solutions to this problem by 2050, oceans will contain more plastic than fish (Parker, 2017). Statistics reveal that in 2015, 19.5% of the plastic waste was recycled, 25.5% was burned, while 55 % of the waste was discarded or sent into landfills (Richie, H. et al, 2018). One shocking fact is that the plastic, which is made of Polyethylene Terephthalate (PET), needs 450 years to biodegrade. So, if we drop a plastic bottle in our backyard in 2018, it will not biodegrade until the year 2468. Annie Leonard revealed that we produce one million plastic bottles every minute and the number is likely to increase by 20% by 2020 (Leonard, 2018). The report also stated that less than half of the bottles bought by consumers around the world were collected for recycling and that only 7% of the bottles were used to make new PET bottles. The remainder of the plastic bottles were discarded in the environment and most of this plastic waste finds its way into the oceans. Moreover, about 1,500 plastic bottles end up as waste or are thrown in the ocean every second (Ritchie, 2018).

Many studies have been conducted to indicate that the real victims from the plastic waste that is being discarded daily are animals, humans, and society. Approximately 267 different species have suffered from ingestion of plastic debris and these debris killed an estimated 100,000 marine mammals annually, millions of birds and fishes (Greenpeace International, 2006). Another report revealed that there are “134 species victims of plastic ingestions” in the Mediterranean (World Wildlife Fund, 2018). It is common for people to throw water bottles in garbage bins, a large majority of this plastic waste will find its way to the world’s rivers, seas, and oceans. Eventually, it will be broken down into small particles. These plastic debris are eaten by animals and end up in the food chain. People who regularly eat seafood ingest up to 11,000 tiny pieces of plastic each year (Van Cauwenberghe L. & Janssen, 2014). Tourism is seriously affected by the plastic pollutions. Polluted beaches discourage visitors, which leads to reduced jobs and increased costs for beach cleaning, shipping (costs associated with damaged engines, litter removal, and waste management in harbors), and fishing (reduced and lost catch, damaged nets, and other fishing activities). The European Union fishing fleet loses €61.7 million every year, due to the reduction in the fishing industry (World Wildlife Fund, 2018).

Our solution addresses all three pillars (economic, social, and environmental) of sustainability. Environmentally, our product decreases the amount of plastic waste that is in the environment and also creates a safer environment for future generations. Economically, participants would receive an incentive (sponsor discount or cash reward) for recycling plastic bottles. Sponsors who purchase a *BottleBot* or participate in the incentive program would likely see an increase in sales. Socially, this product brings awareness to the plastic waste problem and shows people how easy it is to recycle and help the environment. The incentives could also be

used as a challenge to schools or organizations to see who could recycle the most. Proceeds could then be given back to the communities the machines are located in.

The most impacted are the consumers and communities that use the *BottleBot* and promote the accompanying education campaign. As communities plastic waste alongside roadways and in other public areas decreases, tourism should increase based on research that shows people do not visit dirty locations. If tourism increases, the rest of the hospitality industry would also see an increase.

Solution Summary

Our product is *BottleBot*, a machine that recycles plastic bottles. This product is intended to reduce plastic bottle waste that is having a negative effect on our earth and the hospitality and tourism industry. *BottleBot* is similar in size to a trash can, which is strategically placed throughout communities. The plastic bottle is inserted into the *BottleBot* machine, scanned to ensure it is an acceptable bottle, then it is compounded to begin the recycling process. The consumer inserting the plastic bottle will receive an incentive through the software application, which will allow them to access the incentive from their mobile device and transfer to any actual cash balance to their bank account. Our *Agents of Change* service is education through social media on plastic pollution and the importance of recycling for sustainable life.

We will use a mixed based business model. We will follow the traditional production based model in that income will be received as through the sale of the *BottleBot* machine. We will also follow the advertising model in which we allow other green and pollution organizations to advertise on our social media outlets and pay us on a “cost per click” bases. We will also follow the subscription model, in that our software is only purchased one time. In the future, accessories may allow purchasers of *BottleBot* to enhance the machine to make it personalized for their own use (The Business Plan Shop, 2018).

The customers using our product vary. Therefore, our customers are all users of plastic bottles, mainly water plastic bottles because, according to consumers' researches, they are number one of all the bottled products (Hu, 2011). The article stated that consumption of bottled water is increasing by ten percent every year worldwide, that it is the fastest growth seen in the developing countries of Asia and South America, and the United States is the largest consumer market for bottled water in the world (Hu, 2011). This reinforces the concept that the *BottleBot*, will have a wide range of customers who will benefit. We hope the product will have a trickle effect. Beginning in city centers and streets; our product will gain recognition. From there, local businesses and restaurants will see the benefits of having the *BottleBot* at their location. Finally, the *BottleBot* will make its way into individual homes.

The *BottleBot* is intended to reduce and recycle plastic bottle waste. First, the bottle is dropped into the *BottleBot*. The machine is able to hold a certain amount of plastic before the machine starts compounding. The plastic is compressed into a compact size, which will then alert the recycle partner that it needs emptying and transported to their plant. At the same time the depositing consumer receives rewards for helping the environment. The solution that *Agents of Change* offers is divided into two levels: (1) the *BottleBot* machine and (2) *Agents of Change* educational Facebook page.

Level 1: (*BottleBot*)

Our *BottleBot* machine aims to encourage people to dispose of the plastic bottles throughout their community and get compensation in return. The *BottleBot* is going to be installed in different places around cities and communities and it can be either indoors or outdoors. The machines that are installed outdoors will use solar energy as its main source of power. People are going to use an app on their mobile device to manage their incentive rewards. The machine will also have a GPS feature that will help people to locate the precise location of the machines in their town and as they travel. The rewards system is similar to many of the credit card reward programs already in existence, except that the incentives are not static. The preferred reward system was established through an initial consumer surveys, but the final rewards system will be determined by the investors and the business sponsors.

As for the machine, its main function is to compact plastic bottles after being inserted into the machine by users. This machine contains a sensor (PET Bottle Detection) that detects the bottle that the users are going to insert in the machine and if it is made of plastic the machine will send a signal to the PLC (Programmable Logic Controller) that will give an order to the gate to open and the crushing cylinders to operate. The bottles will be crushed and accumulated in a container located beneath the cylinders. Underneath there is another cylinder that collects water that may be in the bottles. If the bottles inserted in the machine are not plastic ones, the gate will not open and the bottles are going to be rejected and sent to the rejection container that will be located next to the machine. For each plastic bottle, the users are going to collect a point by inserting the serial number, which will appear on the screen that is fixed in the machine, on their account in the application. Finally, the plastic that is collected is going to be sent to local recycling plants; the water that is collected will be used for different purposes: agriculture, sanitary, or it could be sold to the recycling plants. Our *BottleBot* design drawings maybe found in Appendix A. The Technical design maybe found in Appendix B.

Level 2: (*Agents of Change* Education)

The *Agents of Change* bi-national team believes that any plastic pollution improvement must coincide with raising people's awareness of the dangers of these wastes. In a survey that was conducted about school students' awareness and attitudes regarding plastic pollution it was concluded that people's awareness towards this issue could be raised through more interactive lectures and activities about this issue within the educational system (Bakri, 2017). They also concluded that public authorities and private sectors should be encouraged to involve plastic pollution awareness within other extracurricular informational resources such as social media networks and online games.

Agents of Change in Jordan have initiated a Facebook page (<http://www.facebook.com/Agents Of Change>) which aims to increase people's awareness and understanding of the plastic pollution problem, help to change consumer behaviors and eventually encourage people to take action to stop plastic pollution and live plastic free. This page is going to be part of the application that is going to be used for the machine, and eventually, anybody who is going to use the machine will want to be a part of this page. The page will also serve as an educational resource for students writing reports or doing research. Individuals will have the opportunity to share his or her experience, suggestions, and innovative solutions all in hopes of decreasing the shocking numbers of plastic pollution.

Agents of Change values the quality and usefulness of the *BottleBot* and our community responsibility by continually working to improve our product and services, while brainstorming ways to be more innovative in improving the plastic bottle pollution issue. We excel at working through tough challenges as a collaborative bi-national team and enjoy having fun while learning. *Agents of Change* envision our product and service to be implemented to promote a greener and healthier world not only for today, but for future generations. Through expanding our product line and using materials in a creative and cost effective way for years to come.

Market Analysis

The size of the market that we would potentially be trying to reach would vary depending on the location of the *BottleBot* and if the country it is located in has an existing recycling plan in place. The main object would be to put the product in high traffic areas, which would allow for passing individuals to easily deposit their used plastic bottles. With *BottleBot* being multi-purpose, it could be placed anywhere from a store, car wash, restaurant, garbage site, or other areas that would be convenient for the human consumer to dispose of the plastic waste. With two areas, whose population is drastically different the use of the product could be increased in larger more populated areas, while in place with a smaller amount of people, the location of the product would help determine the amount of use that the machine would get. With the recycling market expecting to see a compound annual growth rate (CAGR) of 6.5% in the next five years, this product's market would increase from year to year (ReportLinker, 2017).

The *BottleBot*'s initial target market will be places where people use bottled water regularly, such as shopping centers, universities, schools, hospitals, recreation centers, beaches, picnic places, parks, and business centers. Our customers are both people who are using bottled water as well as plastic recycling plants that are going to buy the plastic collected by the machine. These targeted users can use this product as a combination of advertisement and provide them with an alternative way to help discard plastic bottles to ensure safe recycling. To help reach our target market, we would be commercializing the product and the benefits that each individual potential buyer could be receiving from this product. We would take the same approach for advertisement as the companies who try to get consumers to purchase their plastic bottles. Using phrases such as, "save the environment one bottle at a time," is a way to appeal to individuals to continually use this product. Businesses who do choose to work with us will see benefits such as advertisement available on the sides of the product to show their cooperation and dedication to the cause. The key suppliers for this product would be all individuals who purchased a plastic bottle beverage. Whether it be a soda bottle or water bottle, placing the item in the machine is how we would receive our supplies.

The most common competition would be local recycling bins. However, the incentive that our product would offer would include the reward of a recycling deposit back or other incentives that a restaurant or store would want to offer. Another competitor would be the reverse vending machine (RVM) that is used in Germany, Norway, Sweden and other countries. The reverse vending machine takes plastic bottles and gives back cash in return. RVMs are typically installed in shopping centers and local supermarkets. Tomra is the RVM that is the closest to the design of the *BottleBot*. Tomra not only accepts bottles and there is an iTunes application called "Tomra ReAct", with the most popular cash value being \$0.5 cents (USA) and they have a global presence (Tomra, n.d.). Yet, *BottleBot* depends on using an application that will provide users

with points for each bottle that they are going to throw in the machine and this will increase the award, besides the use of solar energy which will enable *BottleBot* manufacturers to install this machine in outdoor sights as beaches, shores, forests, parks, and highways. A full Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis maybe seen in Appendix D at the end of this business plan.

A barrier of entry that we would be facing would include getting consumers to use this product over recycling systems that are already offered. This is where our incentives would help benefit the amount of use our product would receive. Based on how often the individual uses the machine would determine the number of rewards that they receive. Overcoming the barrier would consist of getting volunteers or cooperative efforts from organizations that would support the product and efforts to increase recycling. Another barrier that we could potentially face is the people's lack of awareness regarding the need to recycle waste. People in Jordan are still unaware of the amount and the danger of plastic waste despite having rules and regulations that aim to control pollution. Another barrier is that the rent that some businesses will ask for if we need to install our machine in shopping centers or local businesses such as restaurants, hotels, schools, or companies. In addition to this, security problems, such as vandalization that we may face when installing the machine outdoors such as beaches, parks, highways, etc.

The Ministry of Environment in Jordan has agreed to provide *Agents of Change* a number of international funding organizations that could assist us with a local manufacturer for the *BottleBot* machine. The Jordan time is planning on doing a course activity on their campus to earn money to make their first machine. The Lord Fairfax Community College Foundation Board has approved for \$500 USD to be used by the LFCC students to create a working machine also. The Trex Company, Inc. who currently specializes in recycling plastic bags for home building material, has also expressed interest in further discussions on how to add a recycled bag feature to the *BottleBot* machine.

We created and collected consumer data during a two week period through a Google Form. Participants were solicited through social media on our *BottleBot* product Facebook page at: <https://www.facebook.com/groups/351975695602602/>. During this time 210 consumers provided information about their gender, income, plastic bottle purchasing and use habits, along with details about interest in recycling incentives. The results of this survey maybe found in Appendix C at the end of the business plan. *Agents of Change* are going to use social media as primary initial form of marketing and advertising, as the number of worldwide users is expected to reach to 3.02 billion monthly active social media users by 2021 (Statista, 2017); therefore, one of the appropriate marketing media is going to be social media. *Agents of Change* are planning to use the labels found on the water plastic bottles to advertise for the machine, so every buyer will be able to download the app and eventually use the machine the moment he/she buys the bottled water. *Agents of Change* are going to use a Facebook page, to promote for the machine so any new follower may invite his/her friend to the page who will eventually know about the machine. The LFCC team also plans to continue working with the Marketing Expert who visited with the team during the challenge to learn how to better market the *Agents of Change* educational site and publicity of the *BottleBot*.

Forecast

The forecasted sustainability impact is to reduce the waste of plastic bottles. In areas where there is no recycling program, we hope to create sustainable plastic recycling through the use of

our product and educational service. Not only will *BottleBot* reduce plastic bottle waste, but it will also help minimize trash and waste on streets. This product will practice best sustainability practices by reducing plastic waste and maintaining a clean urban environment.

We hope to reach a wide range of customers. There are many people who will benefit from the *BottleBot*. On a large scale, we hope to reach the cities. In order for sustainability to occur, we hope to create recycling programs through the use of our product and community service events through connections made on the social media platform. This would mean the addition of our product to city streets, where people can recycle their plastic bottles on a daily base. This also adds convenience. Reducing and recycling plastic bottles will be convenient when it is easily accessible on city streets and therefore it will be sustainable. Secondly, we hope to reach local businesses and restaurants. By working with business leaders we hope to gain the support of the community to create the lasting sustainability the product has the potential of reaching. Thirdly, we hope to reach individual homes. By placing the prototypes within the family, we hope to educate and reinforce the importance of reducing waste and recycling. Reaching a wide range of customers will promote recycling and maximize sustainability.

With a wide variety of customers as our target, and the concept that recycling plastic can be simple and efficient we hope to begin by selling anywhere between 50 and 100 models. Our product will have the greatest impact when sold to the full customer base. This is because when it is found in city streets and community businesses it will reach the most people and offer the most convenience for recycling plastic; however, in order to reinforce the positivity of a recycling program on an individual basis. Our long-term goals are not limited to but include: reducing plastic waste, increasing the amount of recycled plastic waste, creating a cleaner environment for future generations by the removal of waste and litter, the creation of recycling programs and aiding in the potential compound growth rate, and most importantly, spreading awareness.

Outside of marketing and selling the product to a wide variety of customers, the creation of recycling programs is imperative. The support of city governments in the creation of these programs does not only benefit our prototype but also the community as a whole. On an individual basis, providing educational resources on reducing waste and recycling will be beneficial in the sustainability of our prototype and the goals it hopes to achieve. As stated in our marketing plan, the Jordan team will be hosting on campus activities to obtain funds and the LFCC team was allocated \$500 towards building a *BottleBot*. The entire team will continue researching and soliciting backers to bring *BottleBot* to the World even after the Global Solutions Challenge has completed.

Financials

The most significant cost for our product would be the cost of materials that would be needed to make the machine. However, as this machine does come with a percent back itself to the owner of the machine, it could potentially pay for itself in the way that as more plastic is recycled the more percent that the owner would receive for its help in this process of trying to increase recycling. Another cost we would be facing it's the production of an app that would keep track of all the individuals recycling and could be used in comparison to Apple Pay, where you could have money saved up on your individual account and could use the money in any way

that you would choose to. Other necessary resources are the programmers, communication sensors, and compacting device. Additional costs will also include staff to work with local businesses in the community to obtain incentives.

The estimated *BottleBot* Machine Costs (JDs/USD) are: (1) Building the machine with all of the equipment (two cylinders, automatic door, belt, 3 containers) - cost is 700 JDs/986.75 USD (2) Solar cells (one meter square) and an inverter cost - 200 JDs/281.93 USD, (3) PET Bottle Sensor that detects plastic bottles cost - 100 JDs/140.96 USD, and (4) PLC (Programmable Logic Controller) costs - 280 JDs/394.70 USD. The estimated cost of the incentive application is 30.000 JDs/42.29 USD per hour with approximately 150 hours required. Additional cost may be the use of a space to build and test the *BottleBot* and the cost of modification should the prototype design not work as planned.

Since the machine will have the ability to pay for itself over time, the initial cost may be expensive, however, with the intentions of receiving the rebate the machine would be seen as a plus since it will be not only bringing money to the owner but also increasing the wellbeing of the environment. The team has not at this time, polled business to determine what they would be willing to pay for a *BottleBot* machine and application. That is planned to occur during the actual machine building. The team learned in Week 8 of the challenge that marketing should be done while prototyping, due to the deadline the team was only able to market consumers who would use the machine. To avoid further delay of production, the team decided to expand marketing analysis during physical prototyping.

Final Pitch

It is not a secret that recycling saves energy, protects natural resources, and helps the economy as well. With our environment friendly prototype, we are looking to reduce the overall plastic bottles waste and help all kinds of citizens. This creates a new income for some who would not have the ability to go out and get a job while still helping reduce the amount of plastic waste without having to pay individuals to go out and pick up waste. With its modern technology, it is an innovative solution that can continue to evolve as technology does. Our prototype and solution are going to be known for the positive results it is going to bring to society and to the areas with more recycling problems. One of the amazing solutions this project has is that it will decrease the million tons of municipal waste generated each year as well as decreasing the risk of health due to the environmental impacts of not recycling. Within a few years of adapting this prototype dumpsites and unsanitary landfills will contain less waste and some of the socio-economic problems will come to the nearest end.

The potential for positive impact is exponential. This product has the ability to appeal to a wide range of businesses and individuals alike. With its use of technology, the product is adaptable to modern society and can have the flexibility to continue to adapt to technological advancements. Although the product is simple, it will reduce waste in the environment and provide a friendly alternative to other materials. This product provides a solution to environmental, economic and social problems; therefore, the potential positive impact in all facets is considerable.

Not only is our product practical, but it also provides many solutions to ongoing problems. Our teams were extremely passionate about the problems we are facing and worked hard to create a product that would provide solutions to multiple problems. Agents of Change used the distance to our advantage and set up goals for each side to achieve. This meant we were very

dependent on each other and really focused on a solution that will help each area in the sense that they needed it most. We feel that our team should win due to our dedicated focus on our product and its potential to help save the environment for generations to come while also aiding individuals financially. Both sides of our team got along really well and feel that we were able to receive a better understanding of the cultural differences while working towards a common goal.

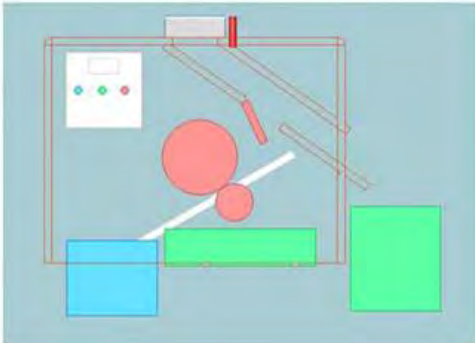
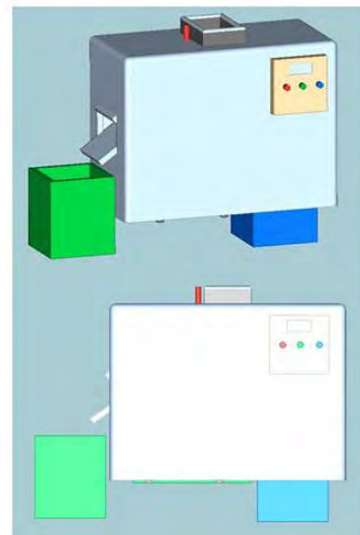
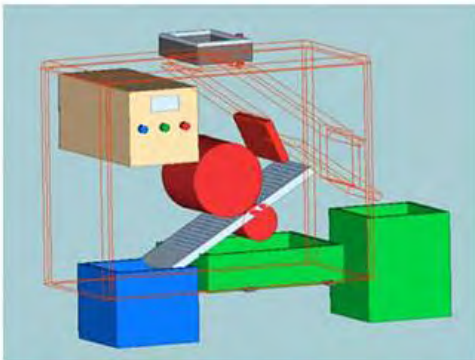
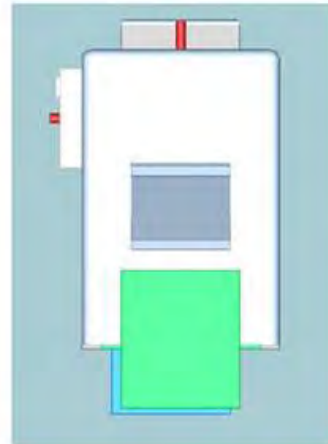
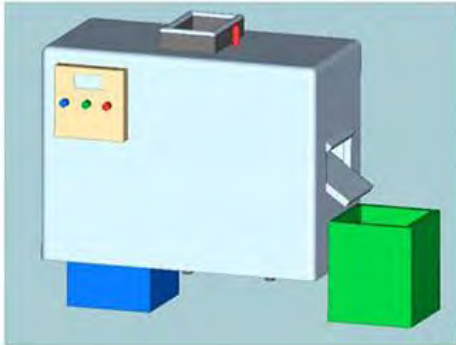
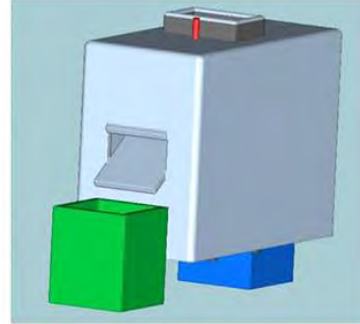
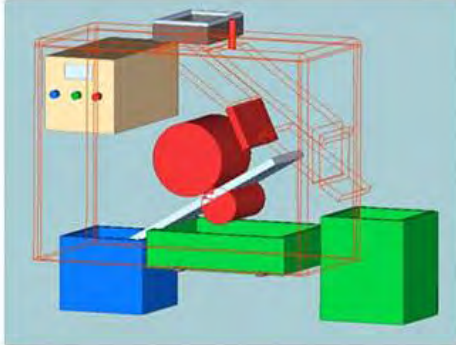
This challenge showed us the difficulties of collaborating with a team overseas. Whether it was a time difference or technological issues, the teams both faced individual challenges that altered our work; however, we learned to overcome the obstacles and come together as one to find a product that could benefit the most people. The experience is something that we are all very grateful for. Each interaction that we had created a new experience for all involved that will help us in the future.

Our team collaborated through a private Facebook group, Oba, Facebook Messenger, Skype, Email, Google Documents and phone calls. Appendix E at the end of the business plan, shows some written notes of how we communicated our plastic pollution idea between within the team. We attempted to learn about each other's cultures by through music, language, government policies, photos, and video sharing. Initially the bi-national facilitators directed the conversation and activities, but then we transitioned to a fully student lead bi-national team with a common goal. Overall our experiences were positive, but as any new team we faced challenges. Some of the challenges were a seven hour time difference, daylight savings time change, use of and concern about social media, school break and national/cultural holidays, selecting a common issue and solution, the cultural difference in the meaning of words like "deadlines", and managing expectations. The LFCC team sent special messages in Arabic and English to our Jordan counterparts and the Jordan team recorded special video messages for the LFCC members in order to build a lasting relationship. LFCC's director and manager have presented on the *BottleBot* and *Agent of Change* solution in hopes to obtain continued support of the team's engagement beyond the challenge.

While the *Agents of Change* team members truly believe that have already won the challenge through the international friendships, improved communication skills, better understanding of the hospitality & tourism industry, expanded technology and research skills, and a gain of marketable team competencies. Some team photos from our Facebook group can be seen in Appendix F at the end of the business plan. We strongly believe that our BottleBot product and plastic pollution educational service position us to be selected as one of the three semi-finalist teams invited to Washington, DC, USA. Not only have we delivered a cross-cultural solution for the Hospitality & Tourism, we have built a bridge between Jordan and Virginia for future World improvement.

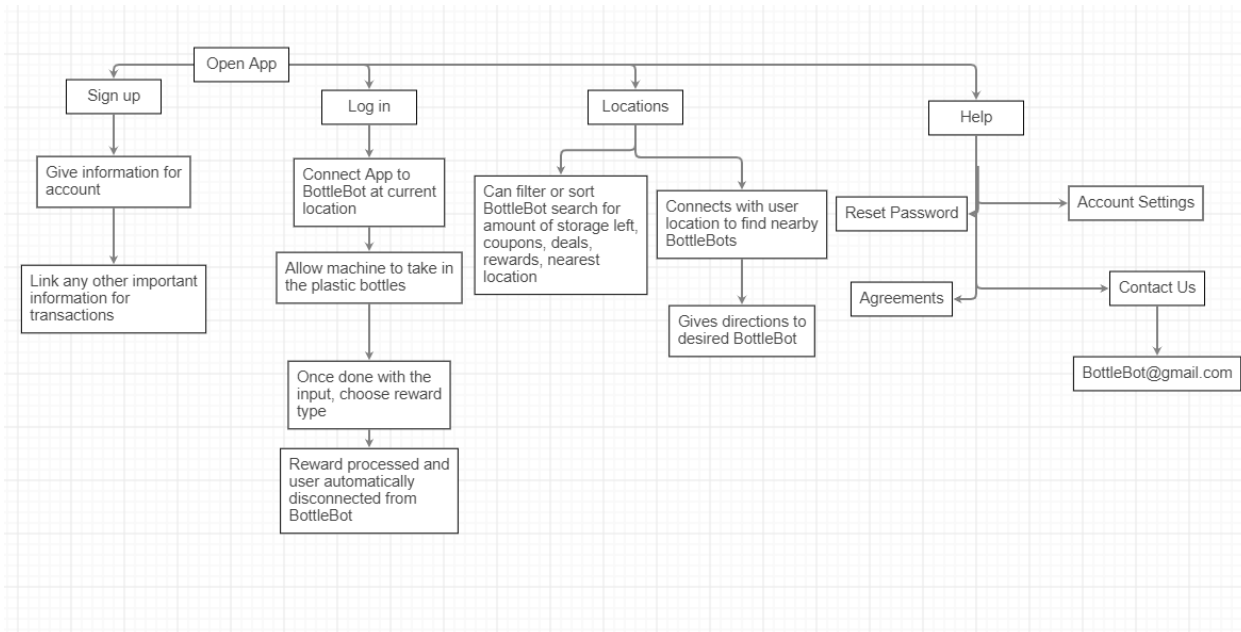
Appendices

Appendix A: BottleBot Drawings

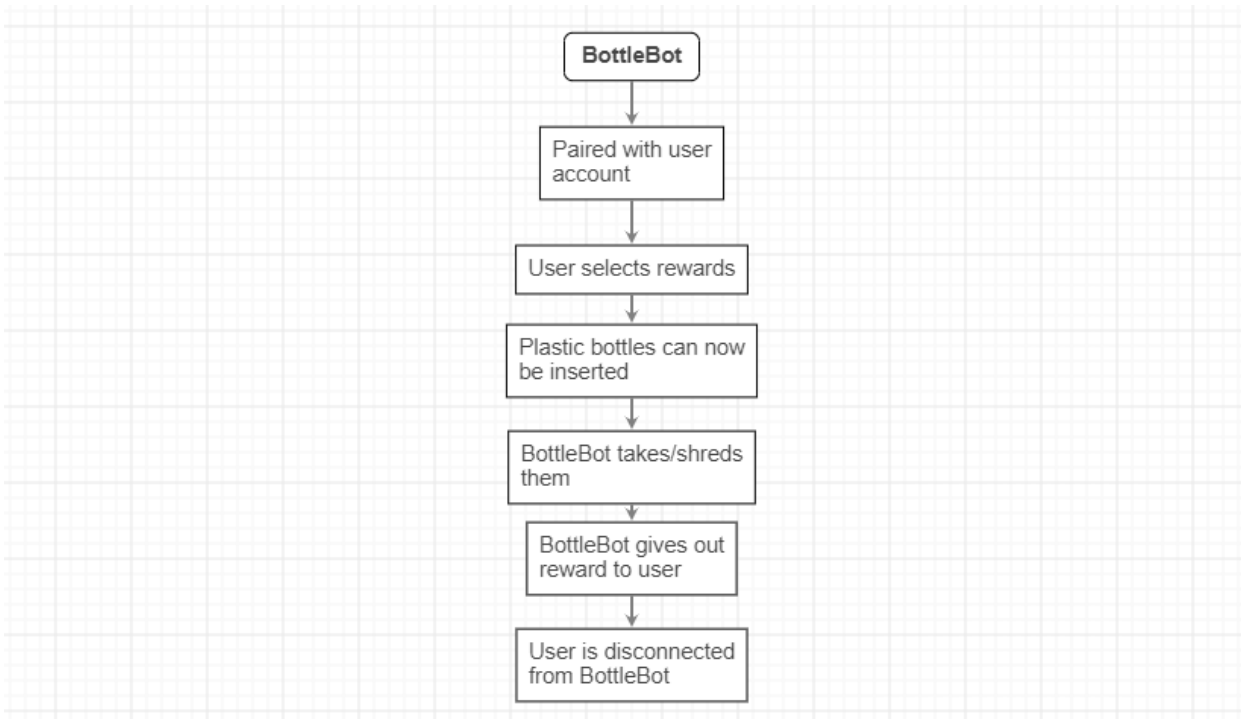


Appendix B: Technical Specifications

Software Application: Flowchart



BottleBot Application: Flowchart

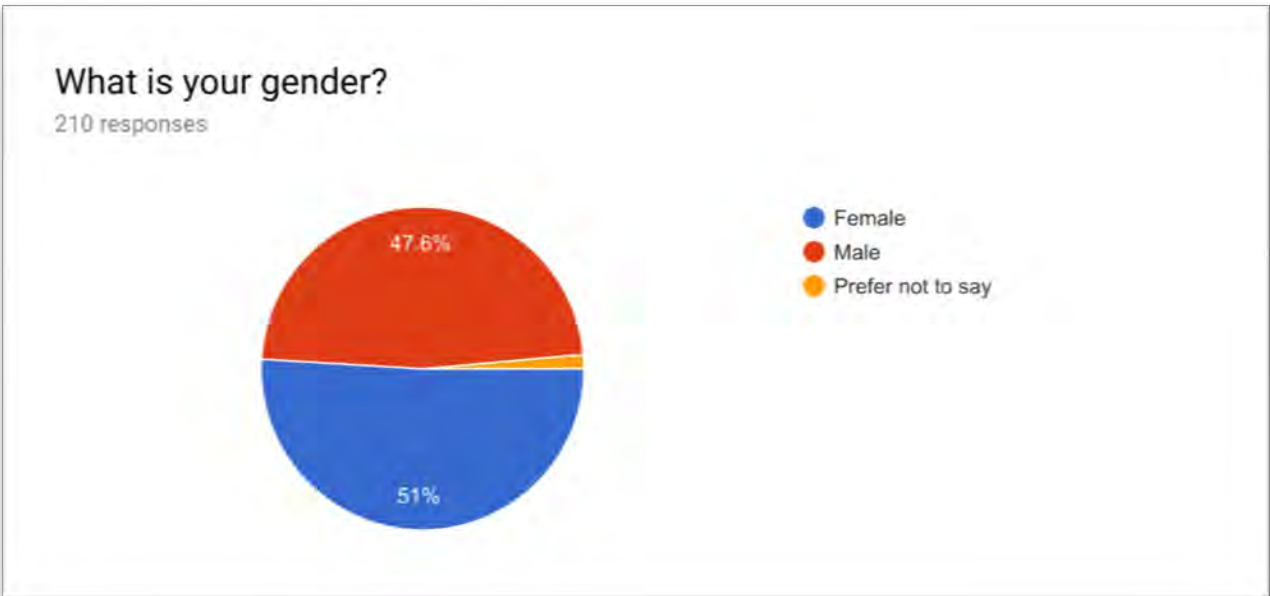
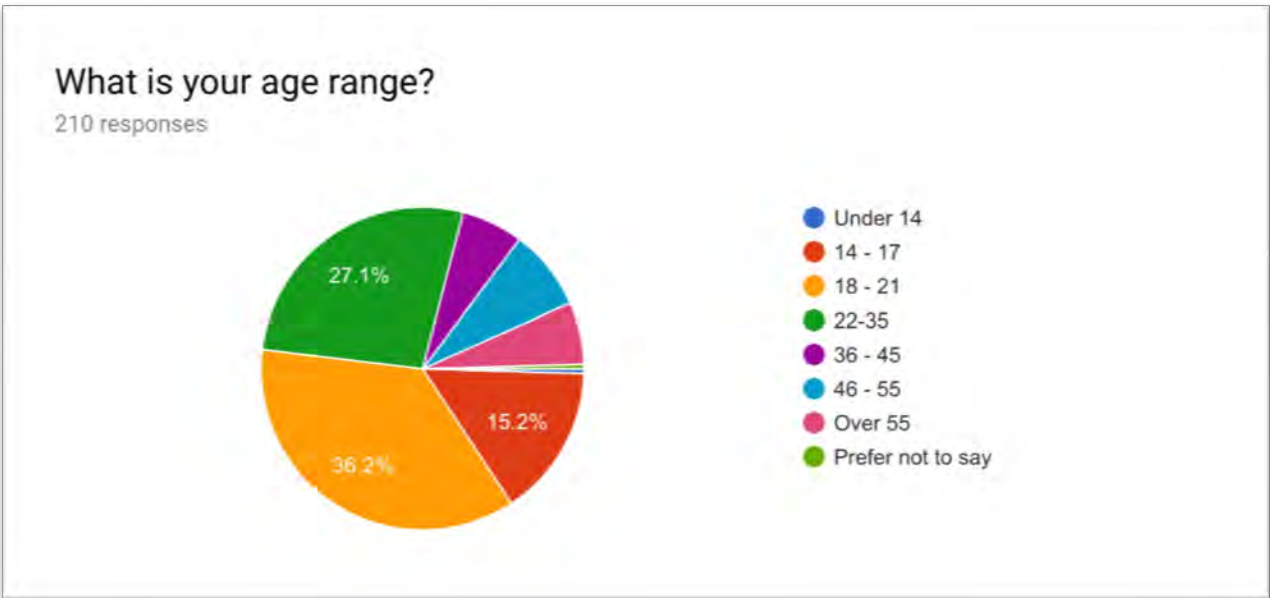


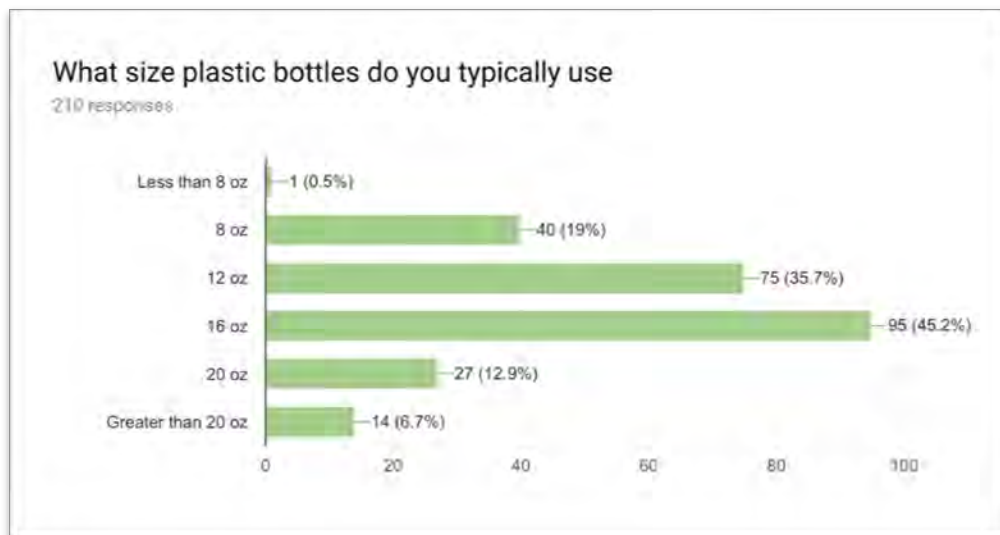
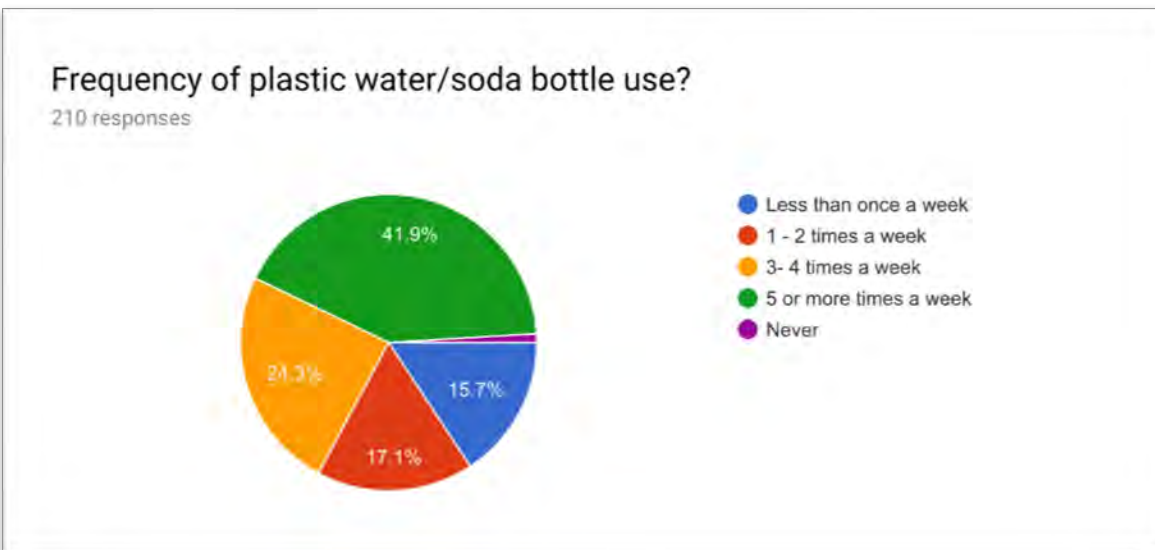
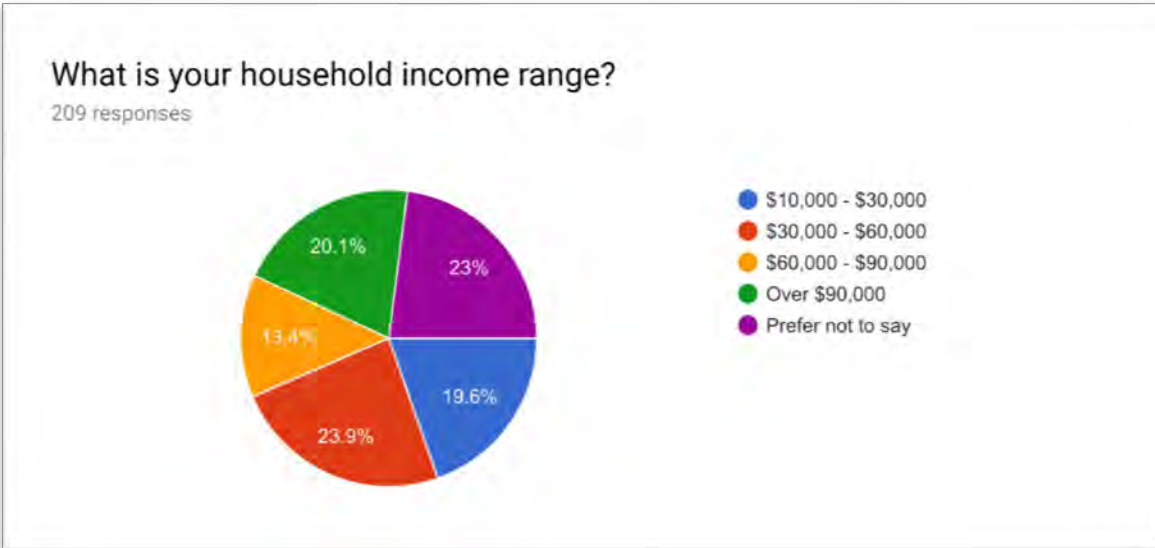
Software Application Pseudocode

- Open app
- Ask user to turn on location (optional)
- If request is denied
 - a. Ask user to input zip code (optional)
- If no zip code entered
 - a. User is free to navigate through different locations
 - b. When user clicks on a location
 - c. App displays bottle bot information
 - d. Such as but not limited to
 - e. Capacity, distance from user, total bottles collect, type of rewards availability
- If user clicks bottle bot
 - a. Ask if directions needed
- If so open maps and sets location to that specific bottle bot
 - a. # When user arrives to bottle bot
 - b. User clicks start
 - c. Displays options on screen
 - d. User selects “dispense” bottle botton
 - e. Ask user to insert bottle
 - f. Sensor scans bottle
- If no bottle is identified
 - a. Wait 15 seconds untils machine starts from the begginging
- If bottle is identified
 - a. Rollers start running
 - b. Bottle gets crushed
 - c. Crushed bottle dispense in storage
 - d. Scan storage for capacity
- If high capacity available
 - a. Reset for next bottle
- If set capacity is reached
 - a. Sensor sends signal to app and screen display for storage replacement and alert users
 - b. # when done dispensing bottles
 - c. User clicks “done”
 - d. Display available rewards
 - e. Ask user to sign up or enter gmail for electronic reward
- If user opts out
 - a. Print Receipt
- If user signs up
 - a. Display bottle bot member benefits
 - b. Such as yearly rewards for total amount of bottles collected
 - c. Navigate user through profile in app

Appendix C: Marketing Survey Results

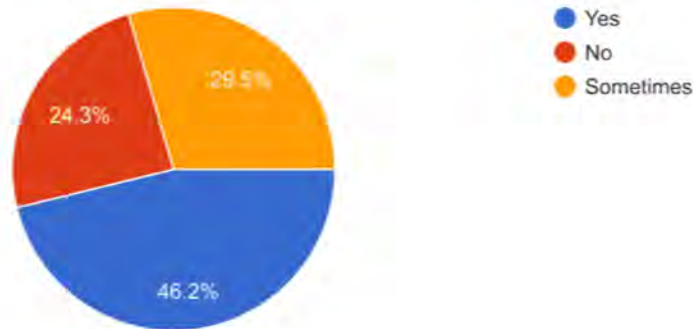
*Obtained through a Google form





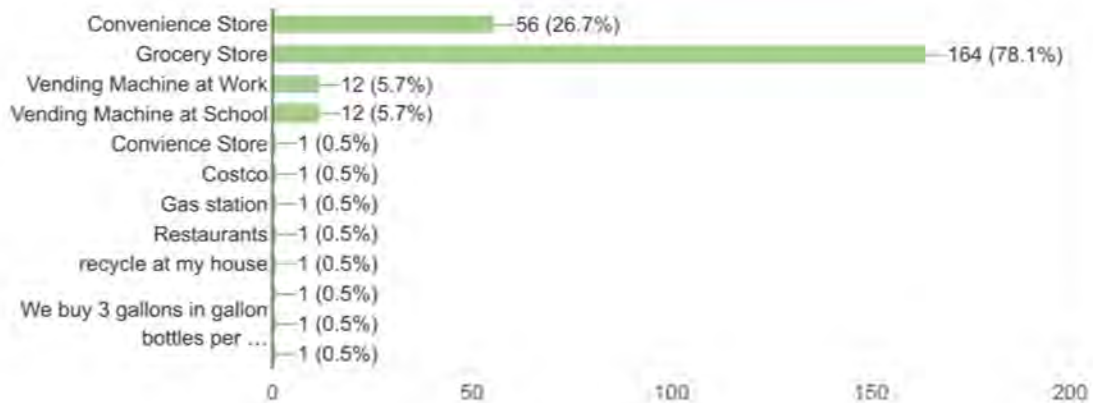
Do you recycle your empty plastic bottles?

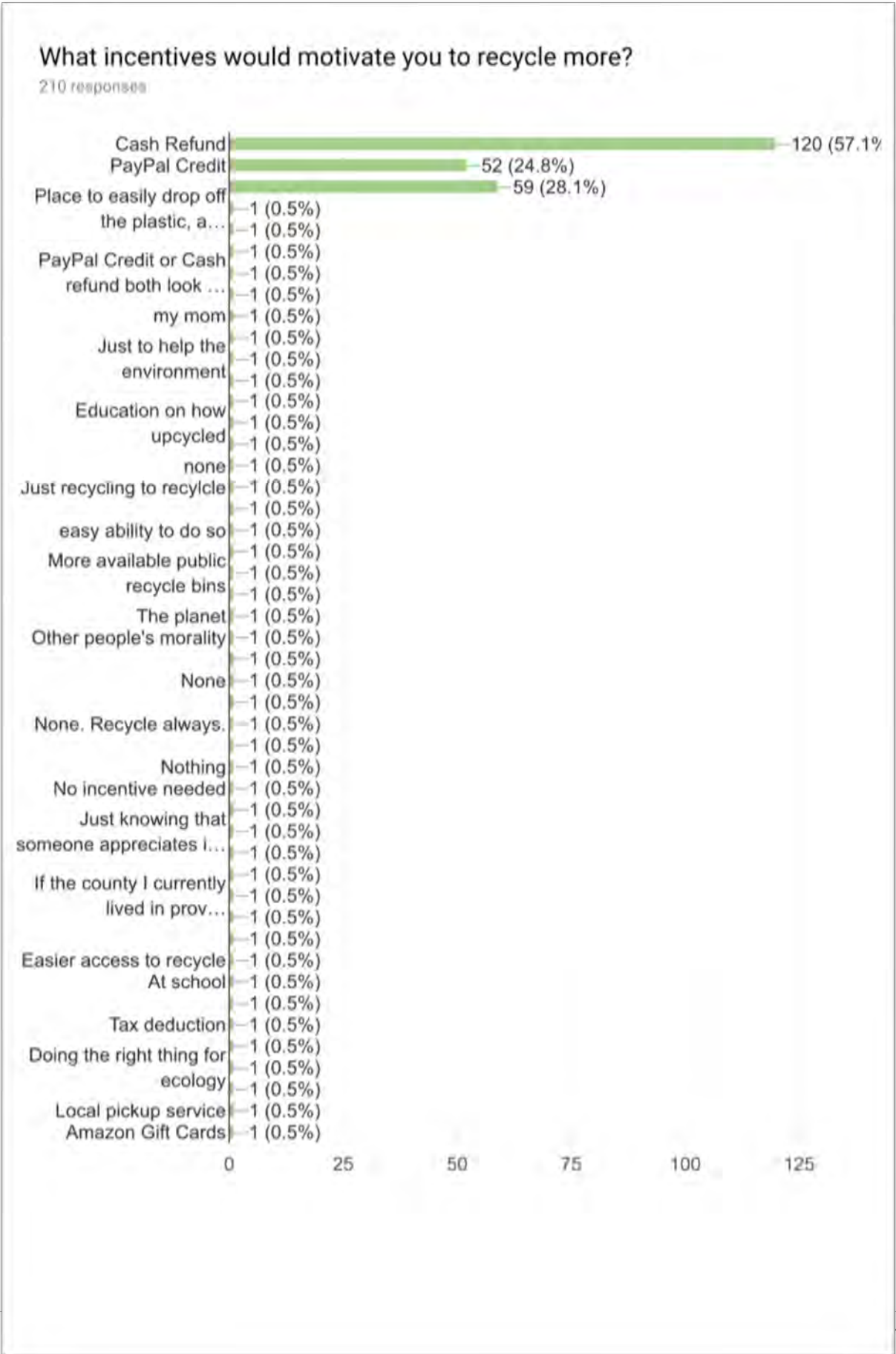
210 responses



Where do you purchase the majority of your disposable plastic water/soda bottles?

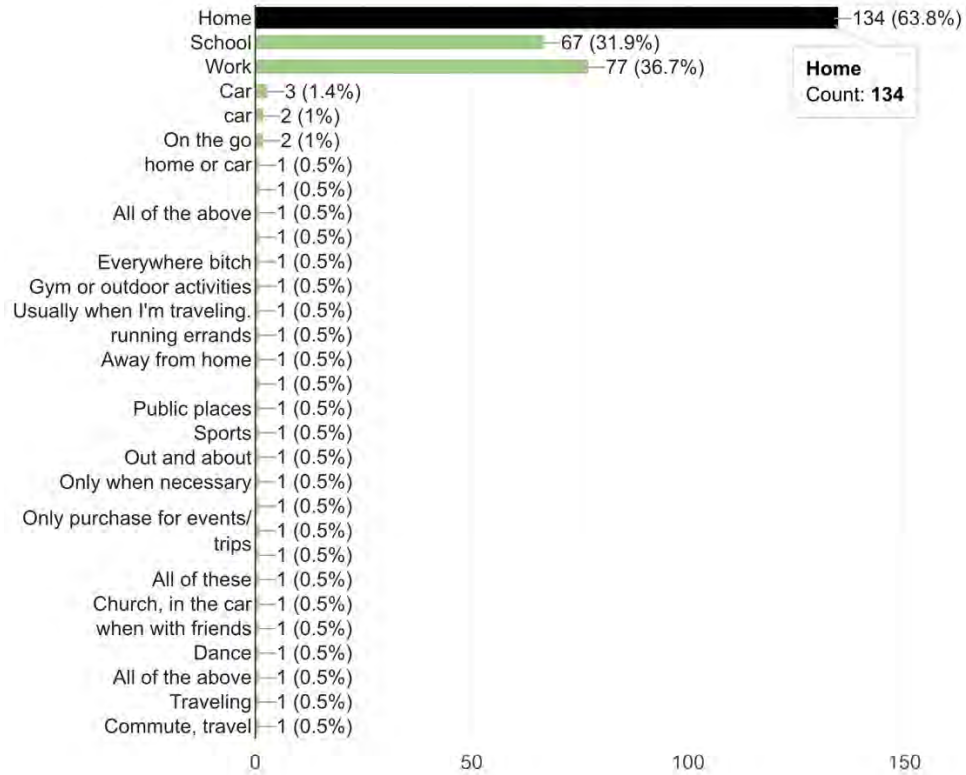
210 responses





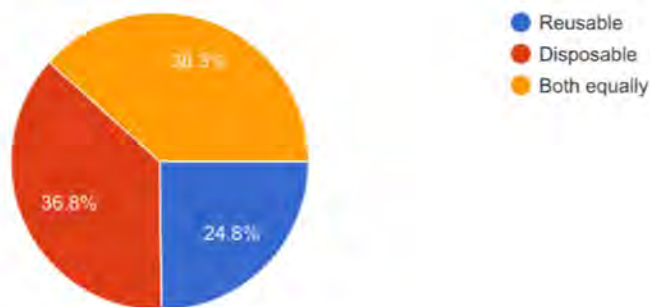
Where do you drink the contents of your plastic bottles ?

210 responses



Do you primarily use reusable or disposable

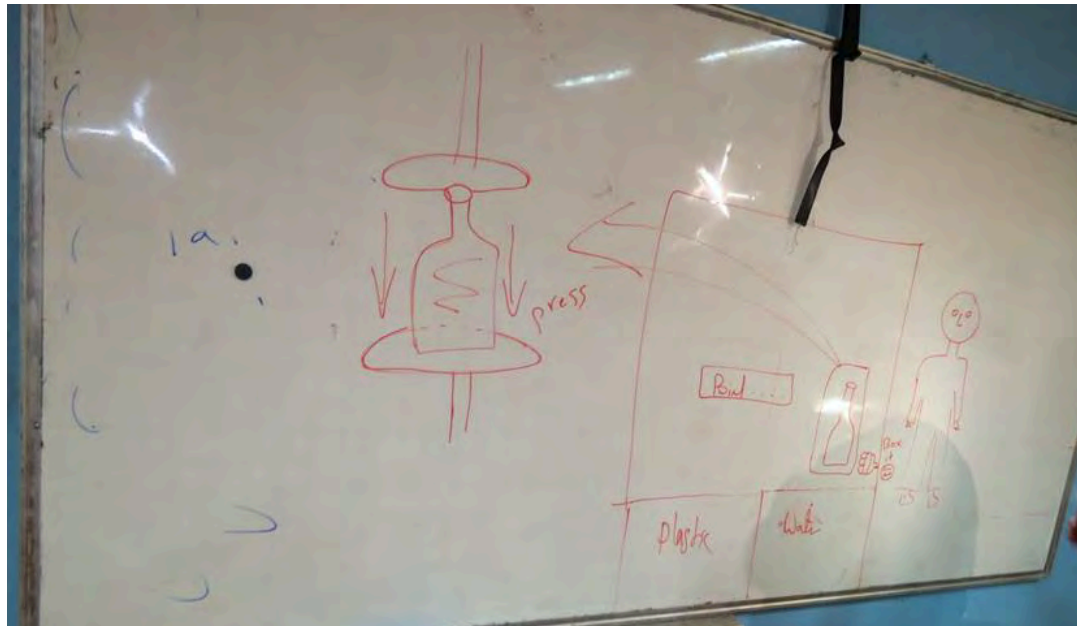
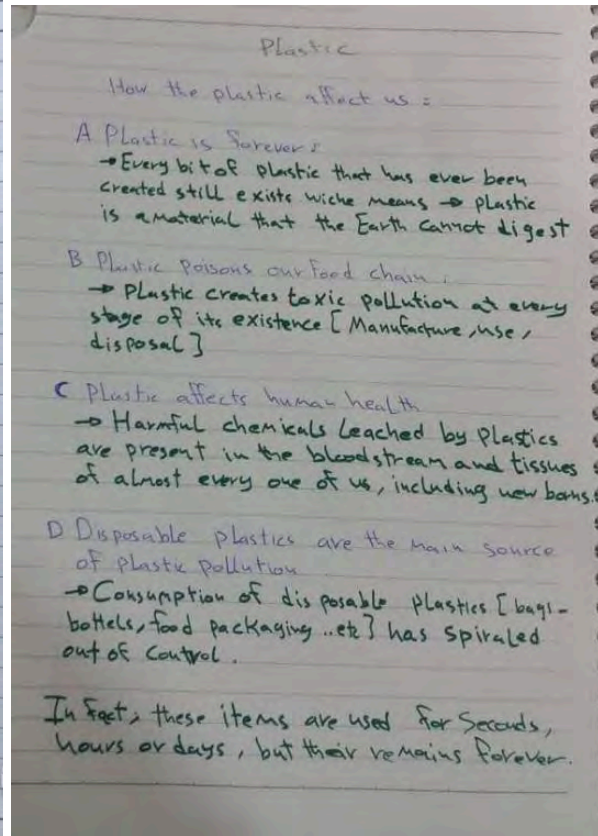
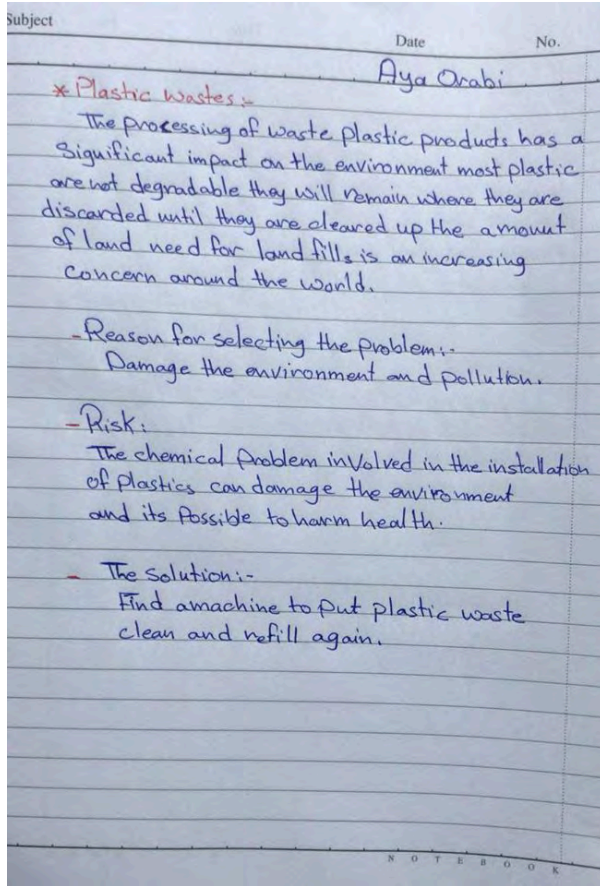
133 responses



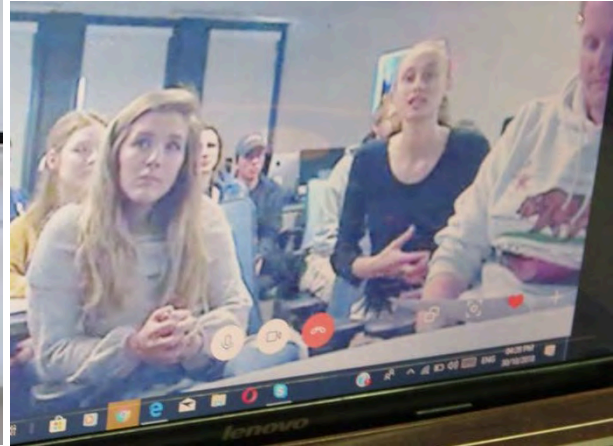
Appendix D: SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> - Using solar energy - Reducing the amount of plastic waste in landfills - Increasing the amount of plastic that is recycled - Providing jobs for local businesses such as plastic recycling plants, programmers, maintenance, etc. - Self-Financing 	<ul style="list-style-type: none"> - Lack of awareness about plastic pollution and the harmful effects - Rejection of machine by locals who collect and sell garbage to plants - Difficulty selling plastic collected to a local marketplace - Difficulty navigating technological platform required by BottleBot - No sponsors
Opportunities	Threats
<ul style="list-style-type: none"> - Cleaner environment - Clean tourist attractions such as beaches and parks (natural attractions) - Education of machine and recycling through the social media page - BottleBot can expand to different places (airports, army canteens, international borders, etc.) 	<ul style="list-style-type: none"> - People choosing to reject the availability of the machine - Businesses not sponsoring product or providing incentives - Technology problems and maintenance - Outdoor machines power capability, especially during warm and cold seasons - Vandalism and theft

Appendix E: Team Communication Examples



Appendix F: Agents of Change Team Photos



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