

NATIONAL DESIGN PROJECT

An initiative of the
Design Education Advisory Committee

2023

The Quad Standard

commonwealth sec sch

Project Overview



Environmental Wellness

How might we promote the well-being of our planet, which faces dangers such as climate change, pollution, loss of biodiversity, waste and resource depletion?

Point Of View (Our target audience)

A busy working adult aged 40, Bob, needs a way to recycle, reuse or reduce the food delivery packaging he receives, to help play a part in improving the environment.



How Might We...

(Our problem statement)

How might we optimise the use of food delivery packaging for **working adult customers**, who use **food delivery somewhat frequently** and **do little to help the environment**, help **improve the environment**.



Why is this an important issue?

- In 2019, 900 thousand tonnes of plastic waste was generated
- In 2020, only 13% of our waste was recycled.
- Of that, 60% could not be recycled.
- Waste sorting has to be done manually
- Recyclables are often smelly and dirty.
- This waste would lead the Semakau Landfill being filled up by 2035

Without recycling, Singapore will soon have nowhere to dispose its waste.

Sources:

[Helping Singapore Recycle Better](#)
[Think You Know How To Recycle?](#)
[Combatting Our Mountain Of Waste](#)



Why is this an important issue?

Environmental Impact

Plastic is non-biodegradable, leading an accumulation in landfills, oceans and other natural habitats.

This pollution harms wildlife, marine ecosystems, and terrestrial ecosystems.

Animals can ingest or become entangled in plastic, leading to injury or death.

Plastic debris also releases harmful chemicals into the environment, affecting water quality and soil health.



Why is this an important issue?

Climate Change

The production of plastic contributes to greenhouse gas emissions.

The extraction and processing of fossil fuels used as raw materials for plastic production release carbon dioxide and other greenhouse gases.

Additionally, plastic waste that ends up in landfills emits methane, a potent greenhouse gas.

Reducing plastic production and improving waste management can help mitigate climate change impacts.



Why is this an important issue?

Human Impact

Plastic pollution can have adverse effects on human health.

When plastic breaks down into microplastics, these particles can enter the food chain and potentially be consumed by humans, raising concerns about the long-term impacts on human health.



Why is this an important issue?

Conclusion

In conclusion, the use of plastic is an important issue due to its significant environmental impacts, threats to marine ecosystems, potential health risks, waste management challenges, contribution to climate change, and the need for sustainable alternatives.

Efforts to reduce plastic use, improve waste management, and promote sustainable alternatives are crucial for mitigating plastic pollution and protecting the environment.



(Source 1) -Existing Solutions (Recycling chute)

All around Singapore, many of the newer HDB flats have implemented built-in recycling chutes to each housing unit, making it convenient for users to recycle, without having the need to make a trip to the void deck to recycle.



(Source 1) - Implications of Solution

Advantages	Disadvantages
Makes the recycling process easily accessible	Expensive to implement
Easy to use	Misuse of the bin, many people do not know what can be recycled.
Improves inclusivity in recycling	High maintenance required
	May not be suitable for all types of residential areas



(Source 2) -Information

- In 2020, only 13% of waste was recycled in Singapore.
- Around 60% of what is recycled cannot be recycled.
- All recyclables should be cleaned, but it is often recycled dirty and smelly
- Waste sorting has to be done manually.
- More than 900 thousand tonnes of plastic waste was produced in 2019.

Sources:

[Helping Singapore Recycle Better](#)
[Think You Know How To Recycle?](#)
[Combatting Our Mountain Of Waste](#)



(Source 2) - Implication

- This implies that throwing away waste is much easier than recycling.
- People do not find cleaning their recyclables convenient/efficient.
- People are dependent on others to do their work for them (cleaning recyclables)



Interview Questions (+ Responses)

- What do you usually buy with food delivery services?
- Why do you use food delivery services? (Convenience?)
 - What makes you need the convenience? What do you do during that time saved?
- What kind of food packaging do you usually get? (cardboard, plastic?)
 - What do you do with this food packaging? How do you recycle them?
- Do you think your goods are kept safe? (In Shape?)



Interview Questions (+ Responses)

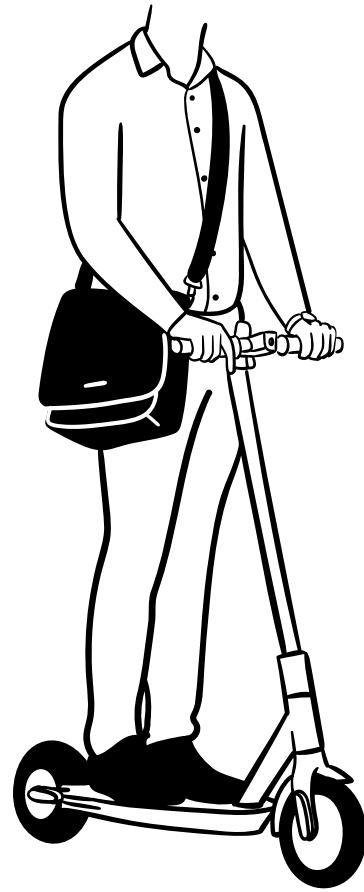
- What are some poor experiences you had with food delivery services? (Quality? Condition? Speed)
- Do you prefer spending less of non-environmentally friendly packaging, or spending more on more environmentally friendly packaging?
- Do you recycle?
 - How do you recycle? **OR** Do you think recycling is important?



Interviewees

- Uncle – Age: 36
- Aunt – Age: 39
- Parents – Age: 39, 40
- Mother – Age: 48





Interviewee 1

Uncle, Grab Rider

Empathy Map(User profile)

- Grab driver Uncle
- Aged 36



SAY/DO

“I also use the app sometimes after I work cuz more convenient for me”
(Me asking how it is convenient for him)
“Cuz always after work, I damn tired. Then I like too tired to go out so I use delivery app so I can just laze in my bed while waiting for the food to come.

“I sometimes recycle sometimes don't cuz like most of the times I too busy with work and too tired to really recycle BUT I got keep bottles that I would get and recycle all of it once a month only”
(asked what to do with the bottles)
“ I just pile it up la. Once I finish drinking I just pile it up den recycle. I also recycle used plastic plates since they're plastic.

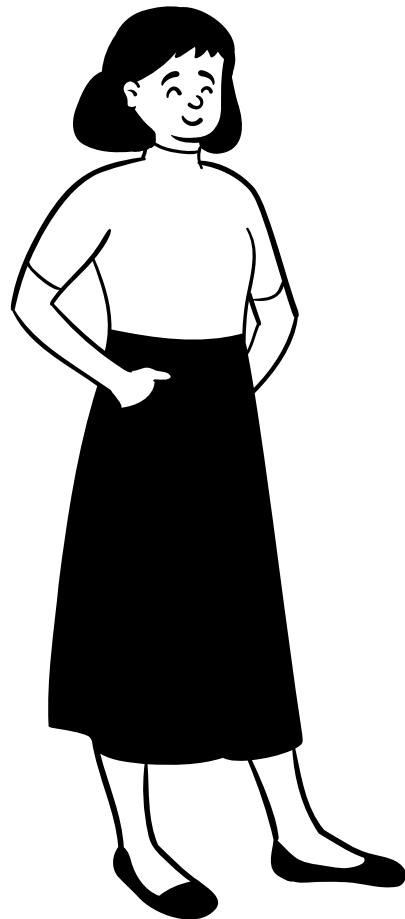
“ I think one issue mainly from delivery is the inconsistent timing you know, like the timing of the food come late at times. Then, I hungry for so long then stay in my bed also for so long only. Also, the packaging sometimes damaged but I don't really care about it as long as got food.”

THINK/FEEL

User values convenience a lot
User values his rest time after work
User worries that he might not have enough rest time if he goes out of the house

User life is too busy to do a kind deed User is quite environmentally friendly but isn't sure how to exactly recycle

User values his time
User doesn't value the looks/ packaging of food User just wants good food



Interviewee 2

Working aunt, 39, uses Grab

Empathy Map(User profile)

- Working aunt
- Aged 39
- Frequently recycles
- Does not know how to correctly recycle
- Uses Grab delivery services very often

SAY/DO

THINK/FEEL

“I use it kinda often because I don’t like having to wait really long, or go all the way to the nearest mall, which is like, idk, 1 or 2km away”

The user not necessarily uses food delivery services for convenience, and instead wants to prevent having to wait for very long to get their food.

“I really don’t know how to properly recycle them”

The users may not recycle, not because they don’t care about the environment, but could be because they don’t really understand proper ways to recycle

“It sometimes spills no matter how much the delivery drivers tie it”

The user knows that the delivery driver intends to ensure the drink is kept safe, but it still spills, so she’s concerned about how can packaging be improved all while being able to keep the food and drinks safe.



Interviewee 3

Working mother, 36

Empathy Map(User profile)

Working Mother
Age 36

<i>SAY/DO</i>	<i>THINK/FEEL</i>
“I find it easier to just throw away the packaging I buy, although I do sometimes feel like collecting it”	The user values convenience
“Sometimes the food is soggy and the packages are all oily, and it is not even recyclable”	The quality of the packaging makes the user not recycle it
“There is eventually no point in buying eco friendly packages and I don’t think it matters to us when we order online”	Eco friendly packages doesn’t make a difference.
“I usually just throw away the packaging as it is usually dirty or oily and you cant reuse it”	The packaging is not recyclable.



Interviewee 4

Working mother, 48

Empathy Map(User profile)

Working mother, 48

SAY/DO

THINK/FEEL

“ looks troublesome to load and unload”

Don't think that it might work well because it looks bulky

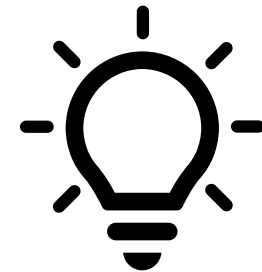
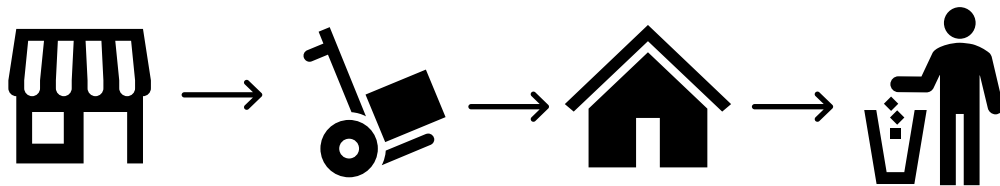
“too much resources used just to save a few plastics?
May not be worth it.:

Proposed
Solution



Ideation (Brainstorm)

- We came up with a few phases - the shop, the delivery, the house and the recycling – and produced ideas for each phase.
- Keeping in mind that we could go "crazy", we generated lots of ideas :D
- Then, we started to build up on each other's ideas!
- <https://padlet.com/rizmanhassan/ideas-ideas-ideas-d9lwsx6ojj1fkqua>



Ideation (Brainstorm)

☆ HMW optimise the use of food delivery packaging for working adult customers, who use food delivery smwt frequently and do not do much to help the environment, in order to help improve the environment.

☆

plastic or glass or waste → detect + sort

general glass metal plastic

Pros: convenient
 more divisions
 cons: uses a lot of resources
 costly

main dish
 soup
 drink
 sides
 Stackable

Pros: reduce packaging
 maximise space
 one packaging for a meal
 easy recycle
 cons: inconvenient for drivers

1. Bento box - Prevents too much packaging per order
 2. Rubbish-sorter chute - Equal recycling
 3. Delivery bag separators - Prevents all items from being from being used
 4. Adaptable package-builder - Prevents poorly sized packaging from being used (oversized)

Adap-2741
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Pros: Reduces excess packaging
 Maximises space
 No spillage
 Cons: Inconvenient for delivery drivers





Pros: Reduces excess packaging
 Cons: Costly

Properties of delivery packaging
 ① waterproof
 ② biodegradable
 ③ minimise resources

NO ERASE/DRAW
 OR 🧠

Ideation (Shortlist)

After creating all the ideas, we decided on 4 ideas we would want to consider most.

1. **Bento Box**: Bento boxes packaging that can be stacked in the delivery bag. 
2. **Rubbish Chute**: Chute that sorts between different materials for recycling. 
3. **Delivery Bag Separator**: Bag that has separators to prevent goods from spilling. 
4. **Adaptable package builder**: Packages that can take different sizes to save resources. 

Using these ideas, we came up with a few criteria before giving points to each idea.

Ideation (Evaluate)

We decided on a few criteria, as well as a voting:

- ❖ Convenience
- ❖ Feasibility (Cost, Resources)
- ❖ Environmentally-Friendly
- ❖ Pleasing

Finally, we concluded that we would use the idea of a delivery/recycling bag separator.

Rationale (Why this solution?)

We chose this solution because we believe that it can help benefit our targeted user, a working adult, as it prevents too much packaging being used, and also allows for easy recycling and sorting.

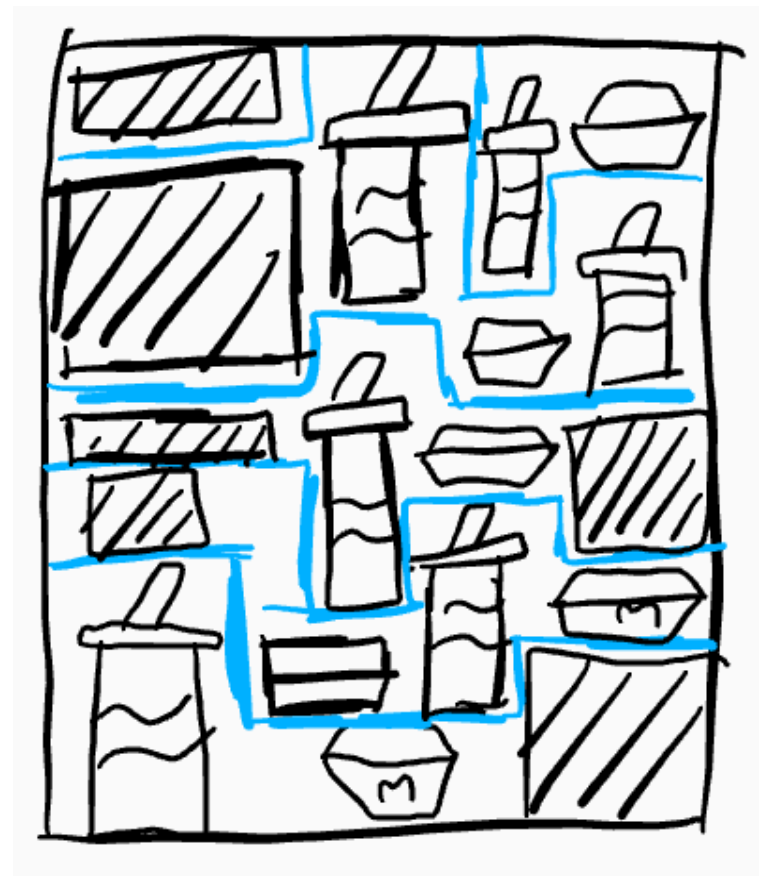
We also chose this solution as it we believe that it will be feasible and pleasing.

How does it work?

The Delivery/Recycling Bag Separator comes with flexible layers.

The flexible layers can be adjusted to the shape of the goods.

This helps prevent it from spilling and minimises the use of plastic packaging for every order or allows for easy sorting of packaging.



Physical
Prototype

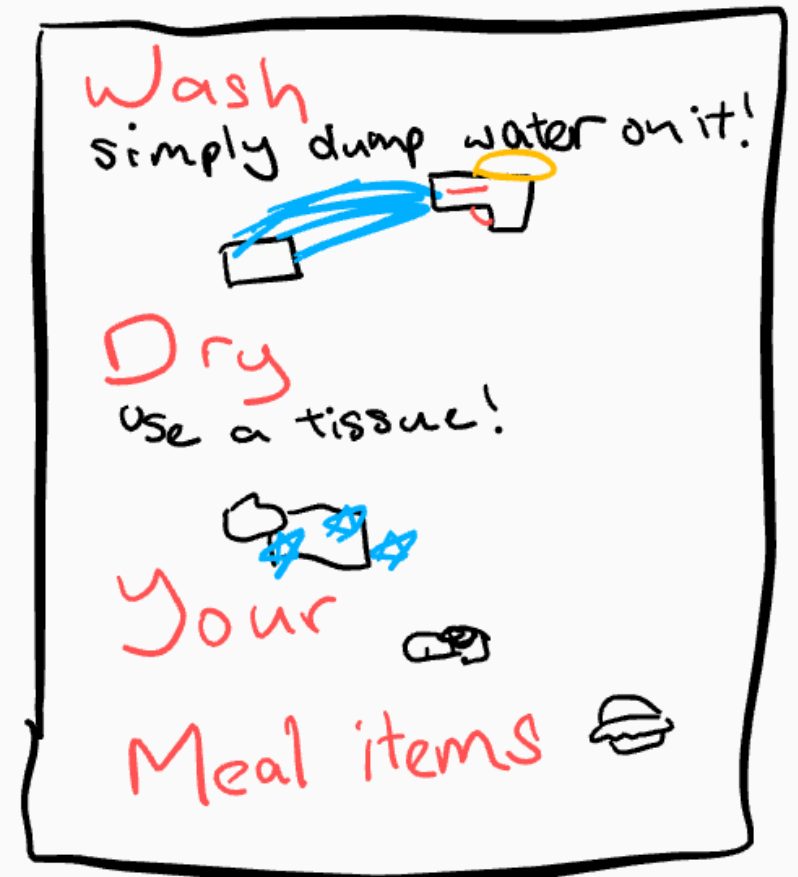


Recycling Bag Separator

Prototype 1

Prototype 1

- This prototype includes an ice-cream stick divider that can be resized.
- Features wheels on the side as an alternative from wearing on the back
- Insulators are also included on the side to prevent mould (If plastic goods are kept inside for a long period of time)
- Includes an easy poster on how to wash recyclables (WDYM)





Delivery Bag divider

Prototype 2



DaBox (Lutfi)

Prototype 3






(d'box)(Xin Lin)

Prototype 4

Testing with the Users




After each of us built our unique prototype, we started on testing.

A few feedback we received were:

- It does not motivate the user to recycle more often. 
- The bag seems quite big and heavy. 
- It does not help in informing how to clean the recyclables first. 

What we learnt from the Users

The users are interested in:

- Being motivated to recycle more often 
- Having a convenient and efficient way of recycling 
- Know how to correctly dispose of the recyclables. (Cleaning, drying) 

Improving our Prototype

Ideas to improve our prototype

After receiving the feedback, we decided on:

- Small openings at the sides for ventilation (prevents mould)
- Adding drying racks on the lid
- The lid acts like a tray to easily collect water, and is reversible
- Flippable wheels
- Velcro on the sides for the separator

how 2 improve ↑

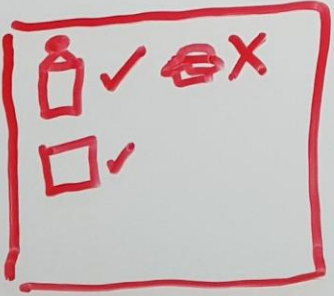
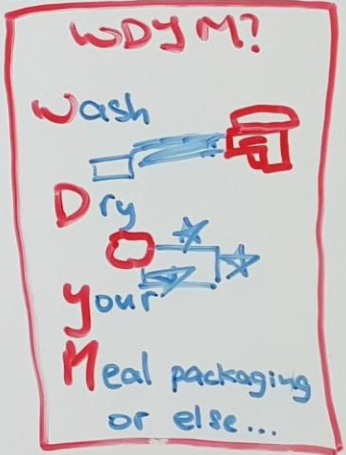
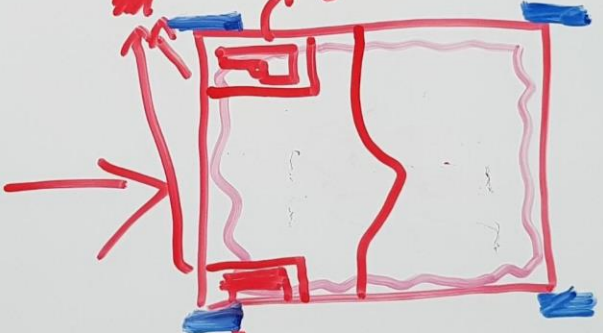
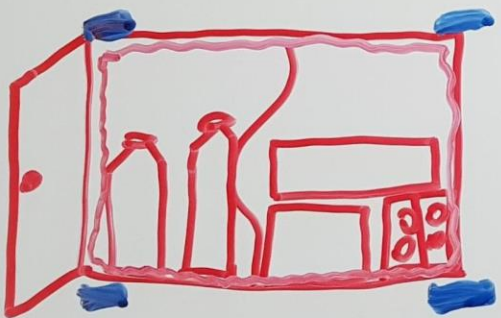
- Fun! ←
- rewarding! ←
- MOTIVATION // (☹)
- CONVENIENT!! // (☹)
- KNOWLEDGE / UNDERSTAND // (☹)
- Easy use
- Accessible
- Efficient

Save \$\$

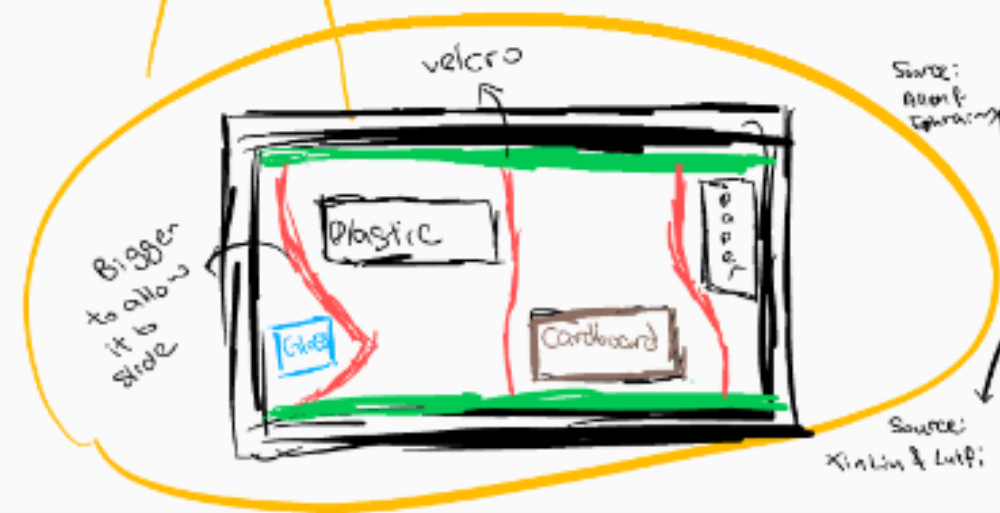
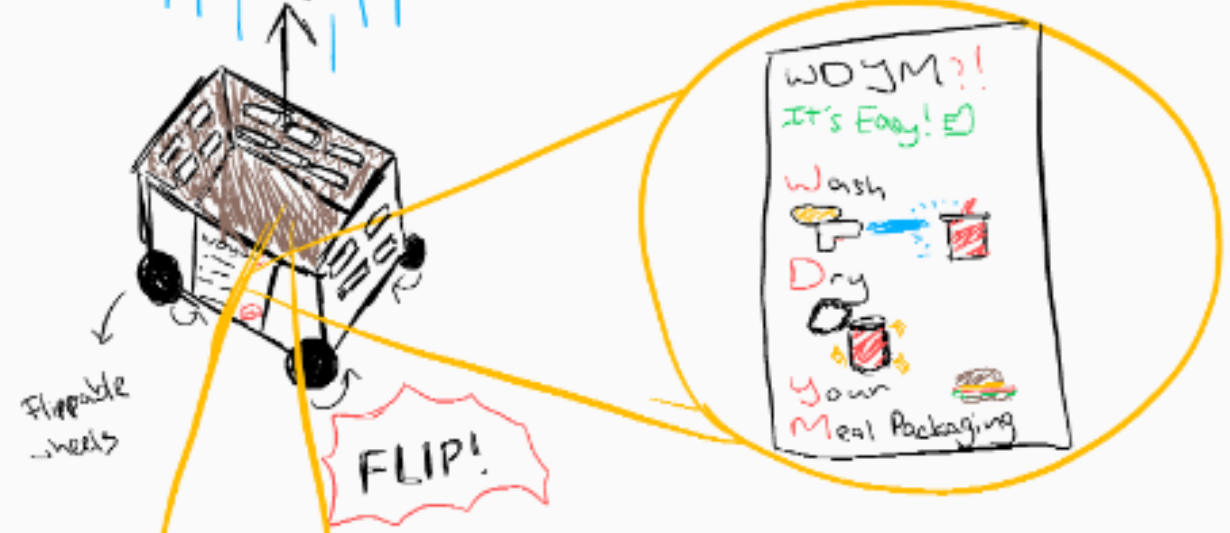
Made in china

Free water gun

RBS



- Reduced size }
- Smaller wheels }



- Materials:
- Box - Cardboard
 - Partition - Tape + ice cream sticks (source: xin lin)
 - Velcro - Velcro (source: xin lin)
 - Tray - Cardboard
 - Wheel - Tape Frame
 - Drying Stick - Ice cream sticks
 - Poster - paper (source: Allen)
- Source: Allen & Lufi



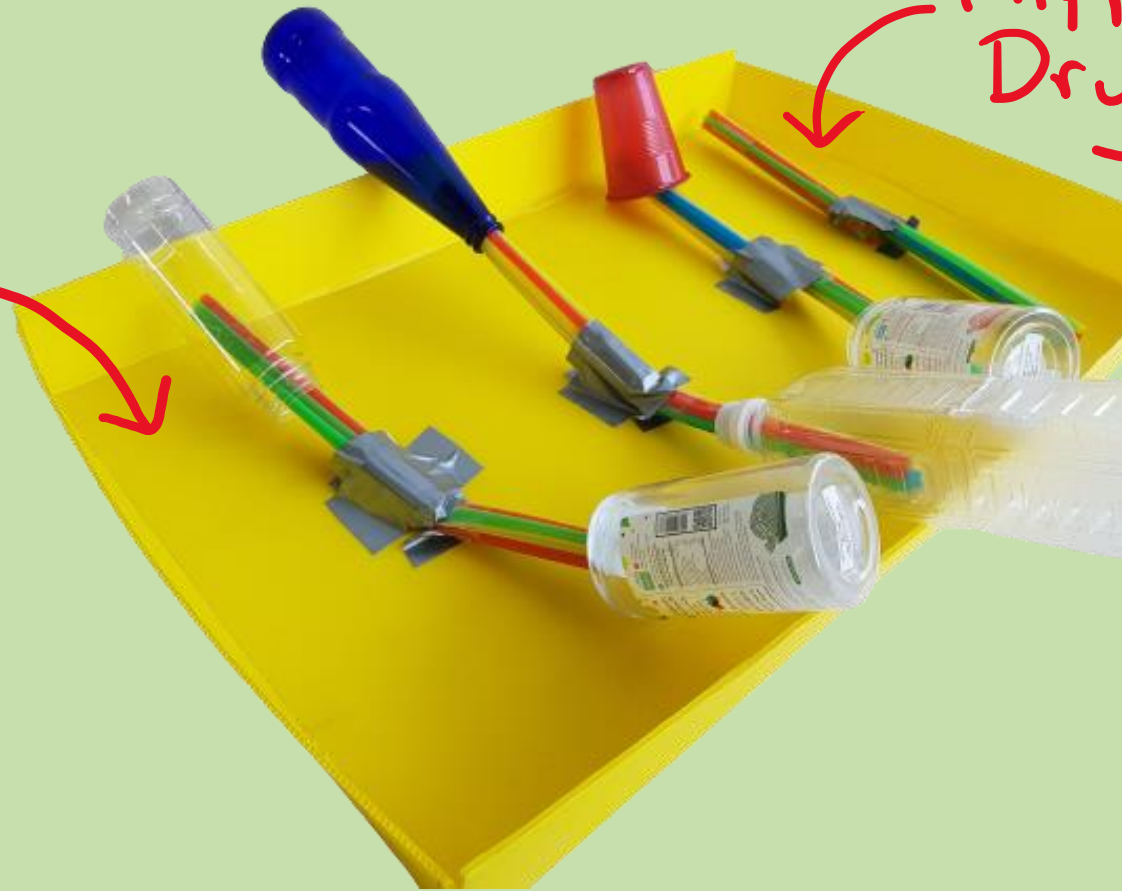
Our Final Prototype

New and Improved Recycling Bag!

Box with holes to prevent mould!



Tray to
collect
water!



Flippable
Drying
Sticks!



R3BOX



Flippable
Tray!



R3BOX



WDYM?!

IT'S EASY!

WASH – DO A QUICK RINSE!



DRY – HANG IT TO DRY!



YOUR

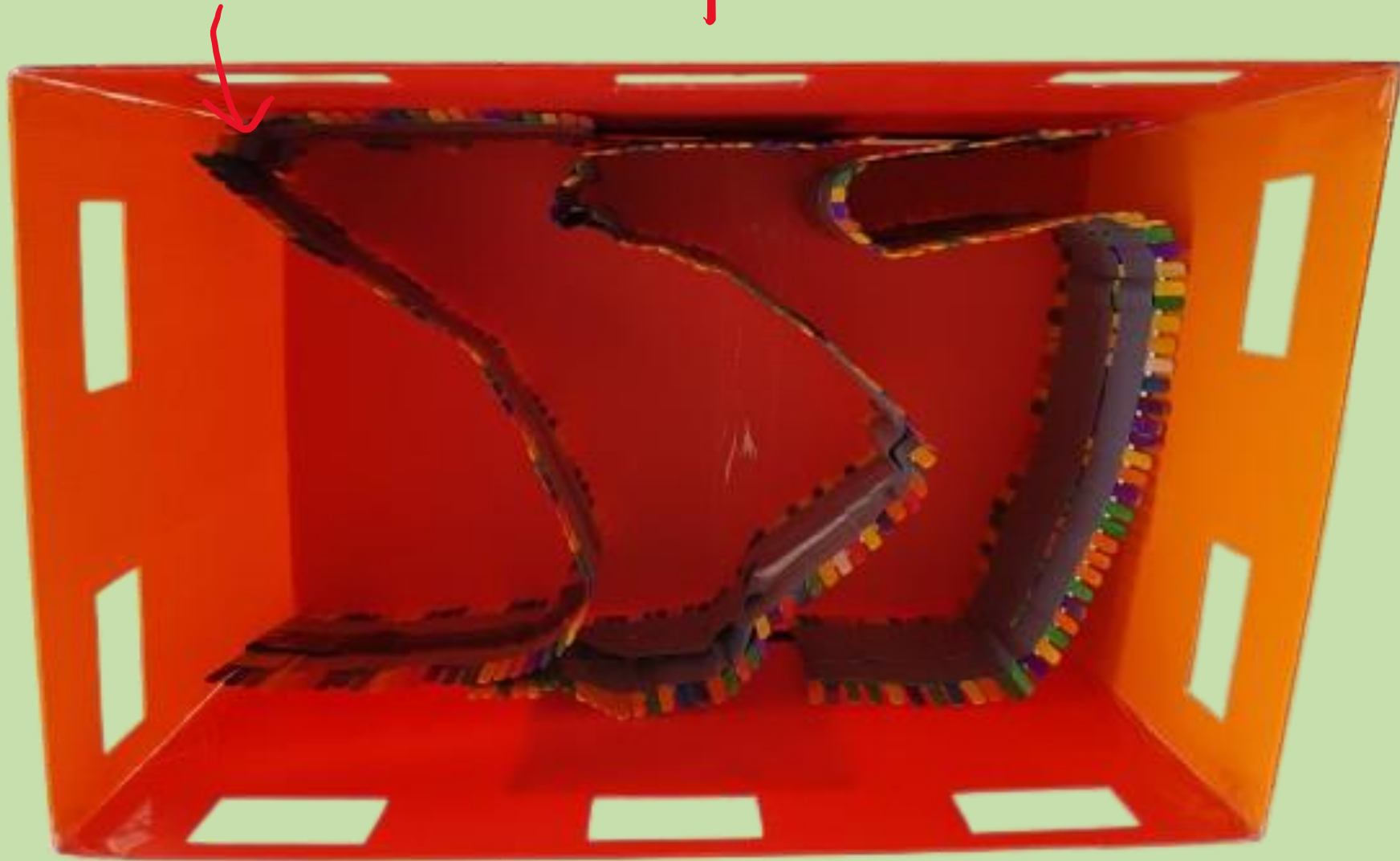
MEAL PACKAGING!!!



BROUGHT TO YOU BY THE
QUAD SQUAD!


R3BOX

Flexible separators!





R3BOX

RECYCLING

MADE

EASIER