

# Student Campaign for Increased Peer Awareness of Food Waste Behaviour

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**Abstract**—This paper investigates how may we design for behaviour change in hopes for a better sustainable outcome. It focuses on one unique behaviour: food waste. This is then narrowed down to looking at the specific food waste behaviour of students in a single public location, their university canteen. The intent is to explore if forming a campaign that is student-led, could increase the level of sustainable behaviour on two segregated levels. Firstly, by offering a leadership opportunity for students to lead the campaign in their universities, in turn creating a better sense of ownership between them and their university community. Secondly, by disrupting the routines of students in the canteen with the simple interventions that the aforementioned students would perform, which would thus create awareness and prevention of food waste in the canteen, and ultimately beyond the said location to the wider community.

**Index Terms**—Food waste, design for behaviour change, University canteens, student campaigns

## I. INTRODUCTION AND LITERATURE REVIEW

### A. Background and Motivation

The average amount of food wasted in developed countries every year is estimated at 200 million tonnes [1]. Avoidable food waste at consumption level is an important research area in raising individual awareness of the impact of individual food waste [2], especially since the EU alone contributes 88 million tonnes of food waste each year [3].

At consumer-level, age is negatively correlated with food waste behaviour, with young adults being one of the highest-wasting groups [4]. An investigation in the UK found that the ‘on-the-go’ culture in a university campus disrupted any intentions to decrease food waste among students [5]. Participants tended to attribute responsibility for food waste behaviour on the university, food service establishments, and society at large as opposed to themselves (‘It’s not me, it’s them’). This is especially worrying when food waste plays a significant role in disrupting Higher Education Institutions’ ability to meet their declared target of at least 80% reduction in Greenhouse Gas and carbon emissions by 2050 [6].

Lack of awareness of the issue was connected to the lack of visual consequences of waste. Furthermore, there is also a lack of understanding on why there is so much food wasted, “we do not yet have a detailed understanding of the quantities of food waste arising from much of the public sector” [7].

Thus, prevention at the individual-level has been identified as one of the most powerful ways to reduce wasted food [8].

### B. Design Brief

1) *Target Behaviour Outcomes*: Students have a limited awareness of food waste issues, and often, established routines get in the way of changing habits [5]. How could this be changed to get students to take responsibility for their food waste?

Small “social-psychological interventions” in the education environment have the potential to have a lasting effect on a student’s education and awareness [9]. Which is why the intervention location, being at a university canteen, is important as it is still within the confines of a university setting for the students to still be motivated to learn. Research has also shown that wider factors within a routine should be the main focus when targeting a routine behaviour [10]. Hence there is a need to focus on the routine practice in the canteen, whereby the stakeholders personal behaviour is not essentially key, but rather it is more about what they tend to do within that specific environment.

2) *Intended Outcomes*: The overarching aim of this project would be to create a campaign with a tool-kit of interventions that students can implement in their university canteens to reduce the food waste production of students. The primary stakeholders would be the students themselves, encouraging them to take ownership of the problem as well as providing incentives, by creating the social stimulus of a community of like-minded individuals from other universities as well as leadership role opportunities.

There is also a wider range of stakeholders (as shown in Appendix A) showcasing the bigger picture. The project would require the commitment of the Student Union and often the external catering companies which universities tend to partner with.

### C. Literature Review

1) *Existing Similar Interventions*: Table I showcases interventions that are somewhat related to this project’s intentions of increasing people’s food and sustainability awareness. Some projects are more directed to showcasing quantitative information. People and Planet for example, collects each university’s

Table I  
EXISTING FOOD WASTE DESIGN INTERVENTIONS

Intervention	Method	Outcome	Stakeholders
Wrap "Love food hate waste" [11]	Campaign	Awareness	Everyone, household
People and Planet [12]	Campaigns	Awareness	Student network, universities
Grumpy Bin Social Interaction [13]	Phone App	Awareness/Prevention	Student housing
Poster Intervention in Canteen[14]	Posters	Awareness/Prevention	Students
Poster and Portion size Reduction in Canteen [15]	Posters and portion size	Awareness/Prevention	Students
Portion size and salad opt out in Canteen [16]	Portion size and option to opt out	Prevention	Students
Reducing through sharing using Social Media in Canteen [5]	Social Media (Twitter)	Reduction	Students
Bin Cam and Social Media System [17]	Social Media and new bin system	Prevention/Reduction	Everyone, semi-public spaces
Fridge Camera [18]	14 households with fridge cameras installed and monitored weekly	Awareness	Households
Young Food Waste Fighters Science Club[19]	Campaign/group	Awareness/Prevention	Young students

sustainability efforts and ‘grades’ them comparatively on how well they are doing. Imperial College London, a college that is often ranked highly on other platforms, is ranked 130 out of the 154 universities on the site.

Some of these campaigns have produced promising results in reassuring their target audience that there is realisable potential in reducing a significant amount of food waste within university canteens. Young Food Waste Fighters [19] is the most relevant group, as it shares similar core intentions to what this project wants to achieve. It targets a younger age group, however, (up to 15 years old) and looks to them primarily for creative ideas to a scientific problem, in this case, food waste.

The majority of current interventions tend to use posters as the method of raising awareness in students. This could be due to site based limitations which may require the collaboration of a number of parties for approval, hence the use of posters evolves as the easiest to implement with the least push-back. Having spoken to a representative from WRAP about their case study in a university [16], their main hurdles were indeed approvals from the chains of command as well as gaining the right level of engagement from students. They found that they needed to increase the sense of ownership students have, both with their food as well as with their university canteen.

Jordan Lazell, who had done his own study [5], also echoed this statement as he emphasised how food waste is embedded in our daily routine in a mundane way, and the need to disrupt it in order to change habits.

2) *EAST Theory*: In the process of understanding what kind of interventions to implement within the canteen environment, references have been made around the Behavioural Insights Team EAST Framework [20]. They used case studies to show how to make campaigns that target behaviour change to work effectively in four simple ways, to make it: Easy, Attractive, Social, Timely. In response to this, table [b] in Appendix A lists possible interventions that could be conducted within the canteen that coincide with this framework. There are three identified key areas within the canteen as spaces where intervening would be most timely and easy. Table [c] in Appendix A shows the considerations made in terms of both the enablers and barriers of the space. One barrier in mind that could also be an enabler, would be the long queue wherein students are hungry and impatient to get their food, leading them to be in an urgent state of wanting to grab as much as they could without thinking how hungry they actually are.

The main behavioural outcomes for most of these interventions would be prevention, reduction and awareness. Most of the selected approaches were related to a gamified intervention of some sort, ideally something that involves the user more by interacting with the space. The key aims of this project would be as follows:

- To interrupt eating out routines to redistribute responsibility of food waste behaviours to students
- To empower students as forces of change
- To reinforce food waste practices of students at university and ultimately, at home

## II. METHODOLOGY

### A. Prototyping Interventions

1) *Imperial Case Study*: A range of interviews with key stakeholders within Imperial as well as in other universities and sectors were conducted (as shown in Appendix C). In Appendix A, graphic [d] showcases information found about the waste organisation and expectation within Imperial College. Where prevention of waste is a key and desirable focus. Prior to prototyping, an observational study was conducted by sitting in the canteen as well as talking to the catering staff. Notes on this study can be found in Appendix B.

2 prototype tests were also conducted in the canteen H-Bar at Imperial College. These included intervention ideas such as an origami tray paper that would fold into a small takeaway box. Images of these can be found in Appendix B. Observations of consumers were then taken in real-life context from 11.45am to 2pm, the lunch hour, which is notably the most significant time for the canteen. Consumers were not aware of the study and made decisions before/after observing the prototypes.

## B. Final Outcome

1) *Campaign* : The campaign includes a PDF toolkit guide, a template document as well as an order form for students to order the table talkers, which is one of the intervention object prototypes. These materials can be found in Appendix D. Graphic [e] in Appendix A showcases the user journey map of students coming into the canteen and how their behaviour would be intended to change when they encounter the three interventions.

This toolkit will be available as free open source content for students on a website: <https://foodwastewatch.com/>. Graphic [f] in Appendix A shows the user journey map of the website built with the intention to propagate the campaign. It hosts a number of other social media sites to encourage connection to other ready made forums that would allow the website to live independently as well.

2) *Campaign Test*: A survey on Qualtrics was conducted with the intention of understanding what would encourage students to sign up for a role within this campaign. The survey was shared among social media sites such as Facebook, Instagram and Twitter.

Three interviews have also taken place with expert advisors in the field. They were all conducted via video conference where the set of questions asked was intentionally kept open ended, allowing for elaboration. This can be found in Appendix B.

## C. Additional Tests

1) *COVID-19 Pandemic*: As in the midst of the project, the global Covid-19 pandemic reached a point where total isolation was required, to various degrees across the world. There was a need to understand how the COVID-19 Pandemic lock-down would affect the project in any way, especially in the awareness levels of students. Two additional surveys were conducted (as shown in Appendix B), the second one being a follow-up questionnaire after a month in isolation.

There was also a group forum created on Facebook called “COVID19 Food Learning and Support Group” with the intention of learning how people are coping with the pandemic in relation to food wasting behaviours.

## III. RESULTS

### A. Prototype Tests: Concept Validation

A decision was made to not continue with the tray prototype in Test 1 referred in Table II. There were many limitations including having to gain approval from the catering staff, increased costs, and possible contradiction with other studies[21], where relying on the presence of a tray could potentially encourage food waste as students may buy more than they need when using a tray.

Results on observations for Test 2 are not as reliable due to the significant decrease in students using the canteen with the impact of the COVID-19 pandemic. Staff were therefore more efficient in clearing out trays such that the intended visual build up of food waste was not entirely achieved.

Table II  
PROTOTYPE TESTS AND OVERALL RESULTS

Test/ Method	Result	Interpretation
Interviews	11 interviews conducted, in person and online over video call	8 out of 11 interviews mentioned the following themes: (a) food waste disposal methods, (b) past intervention experience and (d) stakeholders to consider. Out of the following themes, the frequency of the themes were as follows: (b) being the most frequent (64% of interviews covered this topic), (d) and then (a).
Prototype Test 1	Testing prototypes of poster with menu QR code link and origami paper to be placed on trays	Two posters were stuck on walls leading into the canteen and 30 copies of origami papers were laid out on varying tables across the canteen. Every student coming into the canteen was exposed to the posters before entering, however about 40% looked up to speculate the content. The origami papers were limited to students on the few desks they were laid on.
Prototype Test 2	Prototypes of Table talker and tray collector labels	Labels do need to be modular and movable from one tray collector to the next otherwise may cause more work for staff as they need to move all trays into one collector for ease of transporting them back to their station. Labels to be placed on the wall instead? May need to have a poster on the side with message such as: “you’re contributing to the 830kg of food waste a week”.

### B. Campaign Tests

The use of photography as a means of measurement [22] was brought up in the interviews as seen in Table III and a decision was made to implement this as a suggestion to students to use as a way of conducting their own waste audits.

The campaign survey has influenced the decision to have two waste watchers per university and allowing students to participate in smaller roles by being part of a team rather than just the ability of being the leader. There was also the change of the call to action page (as shown in Appendix A, graphics [k] and [l]) from the previous look to a simpler and more directed design, having the two most popular redirection links available, based on the survey result seen in Figure 1.

Based on the results from the COVID-19 survey, there is some speculation that people feel they would value food more after the pandemic. Approximately 65% of the participants in the second survey pointed out that they have been cooking a greater variety of food, and 47% of participants felt that they would be cooking at home more often after the pandemic, indicating perhaps more of a bond with food. Links to full results and questionnaires can be found in Appendix B.

Table III  
VALIDATION TEST RESULTS OVERVIEW

Test	Validation Type	Result	Interpretation
Campaign Interviews	Technical Validation	3 interviews conducted via online video call	The question of how to measure the success of this campaign has come up quite often. Positive feedback that it is something needed and could be easily implemented which is lacking from existing similar campaigns. The combination of all interventions is crucial; it is the sequence of interventions that would cause the most impact.
Campaign Survey	Market Validation	61 participants	44 participants clicked yes/maybe to taking part of the campaign, with one of the main motivators to encourage them to sign up being the ability to share the role with someone else. Graphics [g] and [h] can be found in Appendix A.
COVID-19 Food Behaviour Survey	Behaviour Validation	52 participants answered the first survey whereby 27 agreed to be contacted again for the second. 15 participants answered the second survey.	There seems to still be a sense of belief that the majority do not waste much food at home, as shown in graphics [i] and [j] in Appendix A. However there is still a large majority, as seen in Figure 2, that do agree that they value food more than before as a result of this pandemic.

Q5 - Of the four bright orange buttons, which would you be inclined to click first?

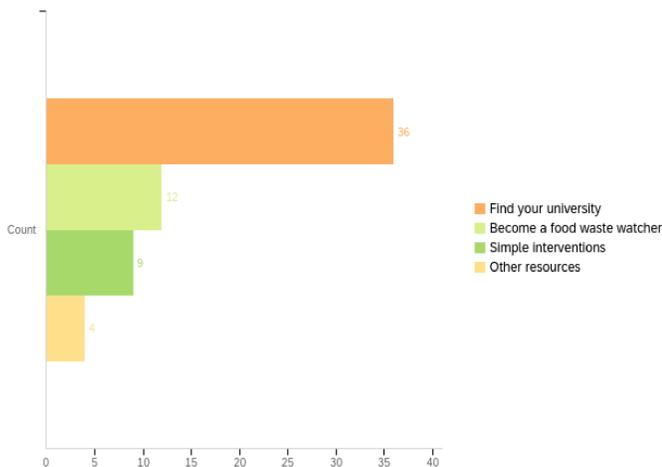


Figure 1. Question 5 from Campaign Survey

Do you think you value food more than before

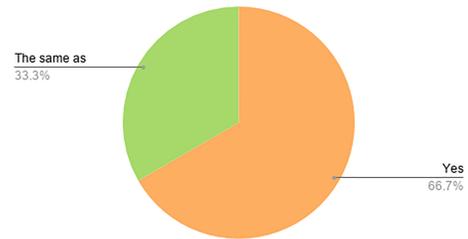


Figure 2. Question from Pandemic Survey 2

#### IV. DISCUSSION

Table IV  
LIMITATIONS OF PROTOTYPE TESTS

Test	Limitations
Prototype Test 1	Tray prototypes were not placed on the trays from the beginning as approval was not granted. Also since trays were all placed face down, it would require catering to rethink their tray dispensing placement.
Prototype Test 2	Conducted during the early stages of the COVID-19 pandemic, where there was already a significant drop in student numbers compared to the first observation and the first test.

Table V  
LIMITATIONS OF CAMPAIGN TESTS

Test	Limitations
Campaign Interviews	Participants may not read through the campaign resources in depth. They would be biased to associate opinions based on experiences in their single university, not representative of all universities everywhere.
Campaign Survey	Participants' responses to behavioural questions like "would you sign up to become a Food Waste Watcher" would not necessarily reflect their real actions given the chance.

Limitations of prototype tests and campaign tests are stated in the Tables IV and V. There is also an overall awareness that the canteen selected caters to both students, university staff and guests of the university. Hence target audience is not fully saturated within the space.

When the website was presented to the three expert advisors, key points were made on how might the campaign succeed should these issues be addressed:

- A way of measuring success; how might the campaign showcase an easy tool for measuring the food waste saved from doing these interventions so students can see a visual impact of their efforts.
- Be clear about what costs are involved, where they might appear should students go ahead with this campaign.

- Additional advice and guidelines on steps to start the campaign, who to talk to and how often to give feedback to the campaign coordinator as well as what feedback the coordinator would need to receive.

The interviewees also highlighted that what makes this campaign uniquely different to others, is that the key focus is on the students as well as the modular approach of the campaign which allows for a lot more customization and creativity. Some also mentioned the possibility of long term positive effects on the students that participate as "Food Waste Watchers" as well as on the students in the canteen experiencing the interventions. They identified research that proves short targeted interventions would impact a students perception on their learning [23].

The main success targets of this campaign would be its collective approach in student to student communication as well as student to staff. The connections made throughout the campaign would widen the possibility of improvement across the university as a whole as well as allowing the students to gain confidence and experience in inciting change in a system not only at university but in the other greater systems in the future.

## V. CONCLUSION

In order for the campaign to be developed further, there needs to be more initial testing and case studies to prove that the interventions work in our favor for decreasing a significant amount of plate waste. However, it is also important to test the awareness of the students in the canteen when they come across these interventions and how that impacts their routine behaviour. Although there have been many studies as seen in Table I that help support the premise that these simple interventions do make a significant change in disrupting routine behaviours, it would be necessary to make sure that the combination of all three interventions suggested could make a collectively bigger impact on the reduction of food waste as well as student awareness.

This campaign could benefit students as a platform for taking charge and making positive change in their university environment. There are also great opportunities for students who take this forward, to be able to sign up for leadership roles presented by other organisations such as [NUS](#) and [Green Gown Awards](#). These organisations may be additional stepping stones for where this campaign might live in the future. The campaign would also have the opportunity to reflect the aims of the United Nations' Strategy for Education for Sustainable Development[24]. Equipping students particularly in the education of 'Sustainable Development Goal 12', Responsible Consumption and Production.

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## AUTHOR BIO

Naomi Haeger is a multi-disciplinary designer with specific interest in designing around cross-cultural boundaries. She aims to explore and dig deep into people's relationships with each other as well as with objects. She is curious as to how design can come into play in disrupting routines and how we might utilize this methodology to make way for a better, more sustainable future, whilst ensuring that the process is both fun and engaging!

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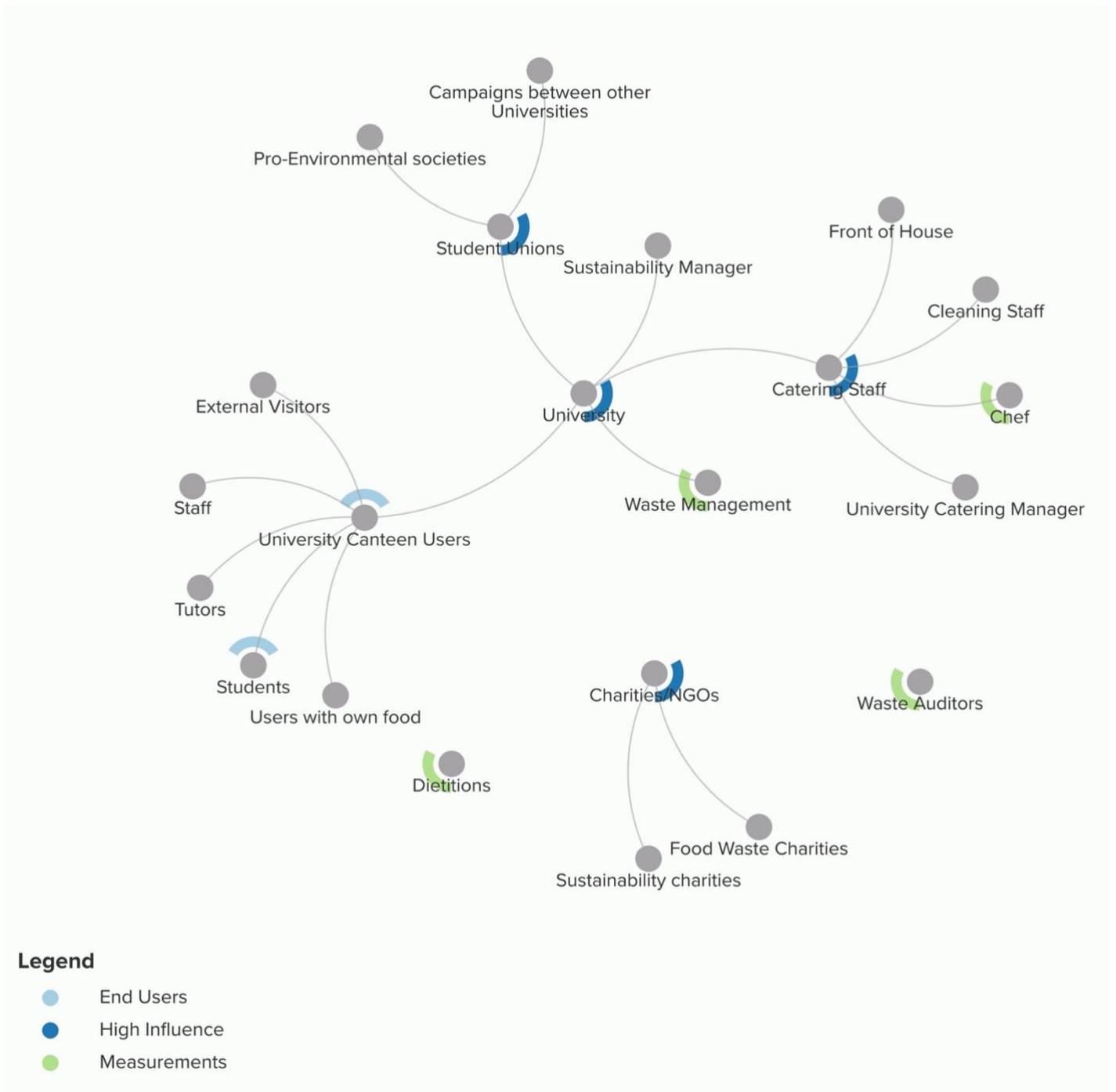
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APPENDICES

Appendix A

GRAPHICS REFERENCE FROM REPORT

[a] Info graphic about stakeholders in the project



[b] Potential design interventions broken down in parts of the canteen

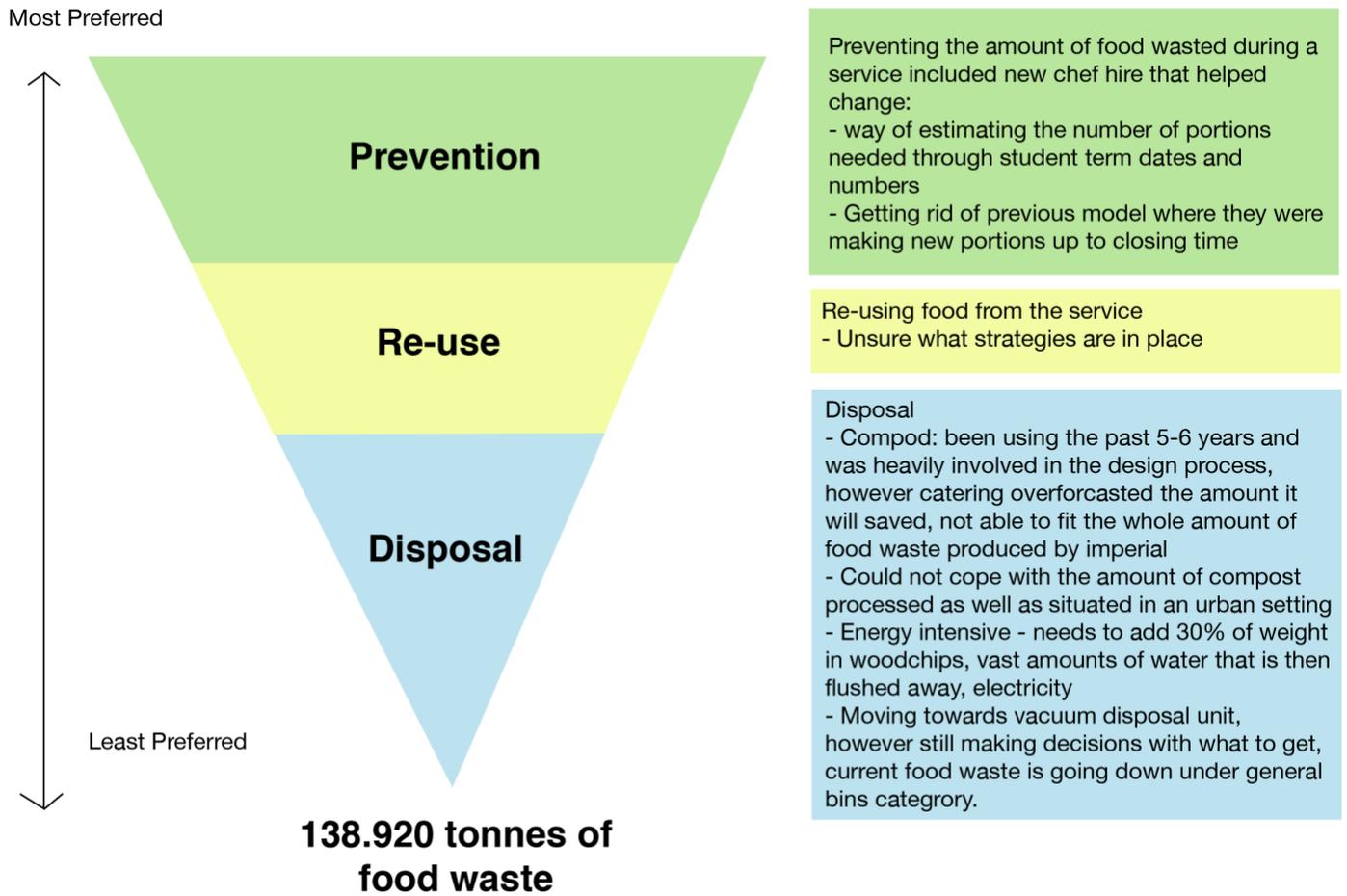
<b>Intervention Point</b>	<b>Intended Outcome</b>	<b>EAST Theory to apply</b>	<b>Behaviour to change</b>	<b>Method</b>
Queueing period before buying	Awareness, Prevention	Timely	Having just enough on the plate to be able to finish, letting the server know what you would not like	Posters, App, AR, Object Installation,
Use of trays	Prevention, Awareness	Easy, Attractive, Timely	To not overfill tray due to space	Redesign trays, have info on trays
Eating with friends	Reduction	Social	Encourage sharing	Game
Eating Alone	Reduction, Awareness	Attractive	Encourage taking away/ bringing own containers	Game, food tracking incentives
Tray Collection Area	Awareness, Reduction	Timely	Have responsibility in waste created, discourage future intentions of wasting food	Game, obstacle, visualisation of waste, learn through sorting of waste
Leaving Cafeteria	Prevention, Reduction, Awareness	Easy, Attractive, Timely	Have a better knowledge and ownership in the food waste they produce	Game, incentive (food waste exchange to compost at home?)

Selected areas of focus during testing of Interventions

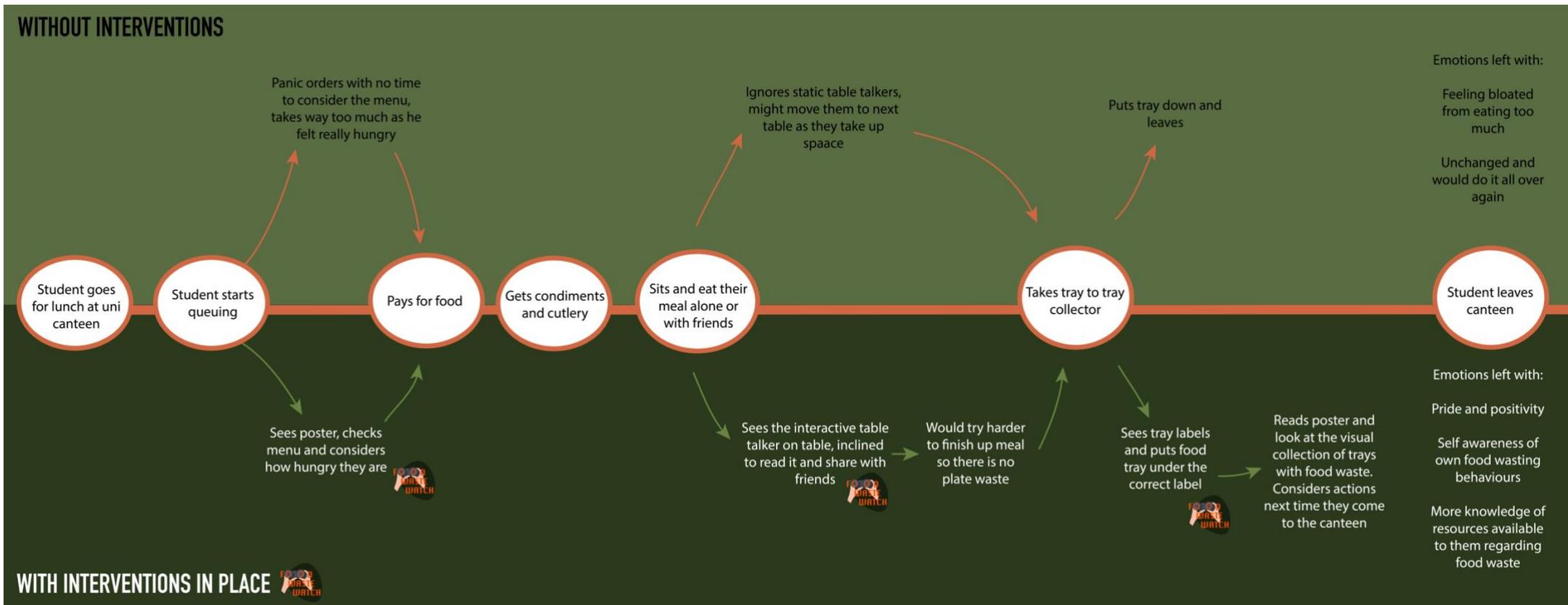
[c] Enablers and Barriers towards reducing food waste in canteens

<b>Enablers</b>	<b>Barriers</b>
Having lunch in groups where there is a potential for sharing	Price point, students wanting to get most out of their money, regardless of appetite
Use of phone (Games, diet tracking) especially in lone eaters	Longer queue time could cause hunger, emphasizing false appetite expectation
Option for different portion sized meals	Time restrictions, must be quick
	Tray collection does not enable students to feel responsible for waste production, but increases speed for collection of trays
	Trays provide space for additional (unnecessary?) purchases and compliments tray collection system
	Catering companies are often external service providers, thus limits the university's ability to create change

*[d] Info graphic of preferred actions to reduce waste in Imperial College London (layout adapted from WRAP, 2013)*



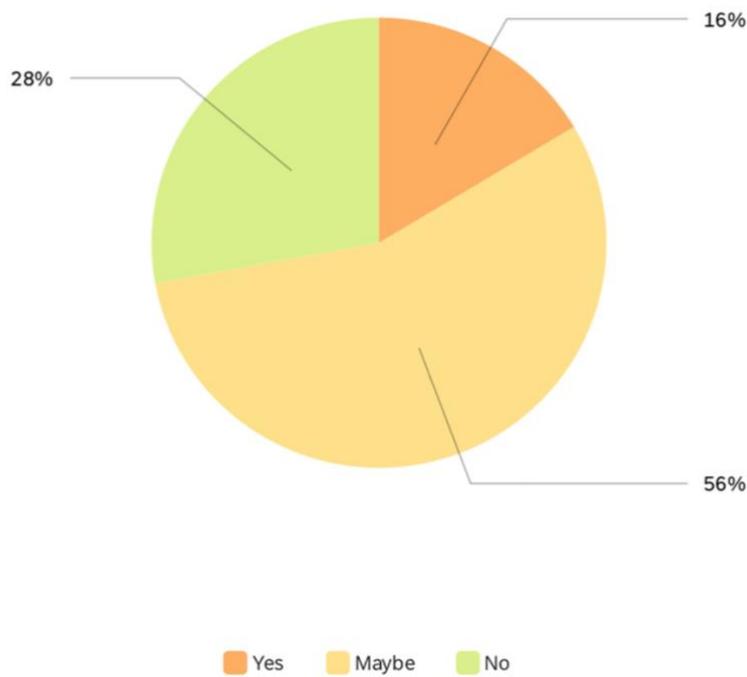
[e] User Journey of students in canteen





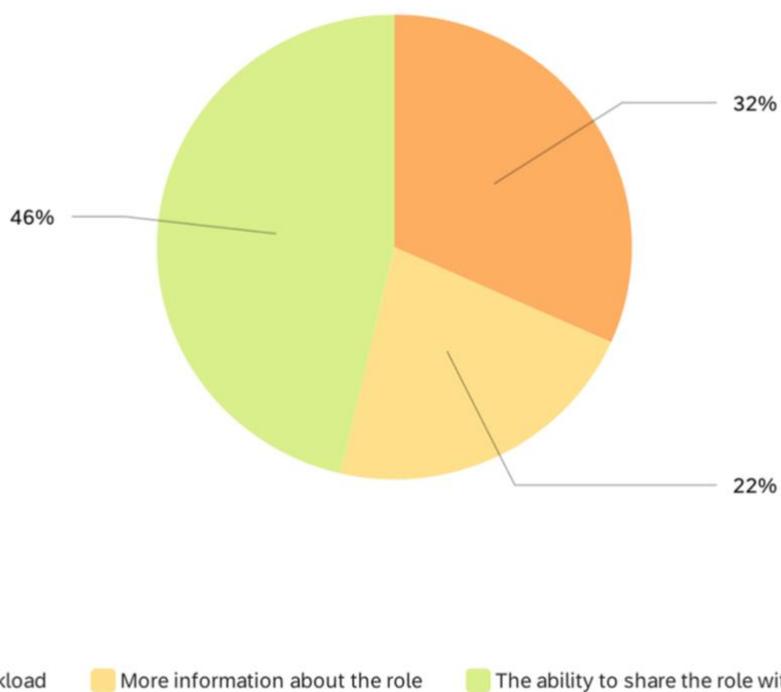
*[g] Question 7 from Campaign Survey*

Q7 - If you were a student, would you sign up to be a Food Waste Watcher?



*[h] Question 7a from Campaign Survey*

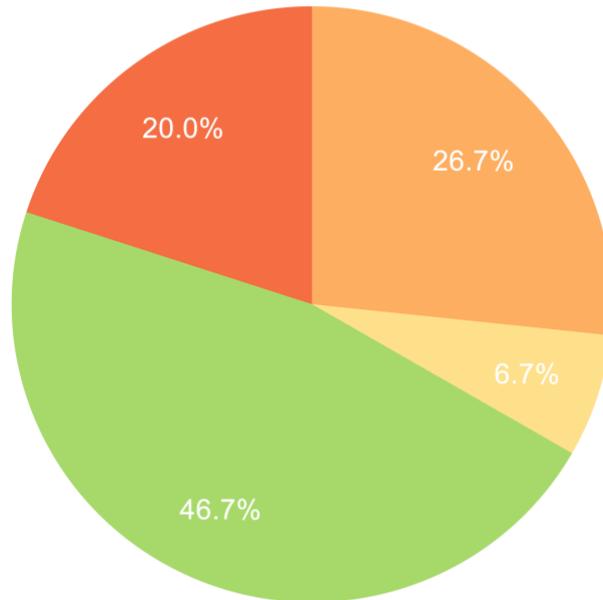
Q7a - Because you answered No/Maybe, what would encourage you to think about it?



[i] Question from Pandemic Survey 1 about amount of food wasted

Have you been wasting much of your food?

- Some perishable food, veg going off, fruit going bad
- Not yet...
- Just peels, bones etc
- No nothing is wasted in my house



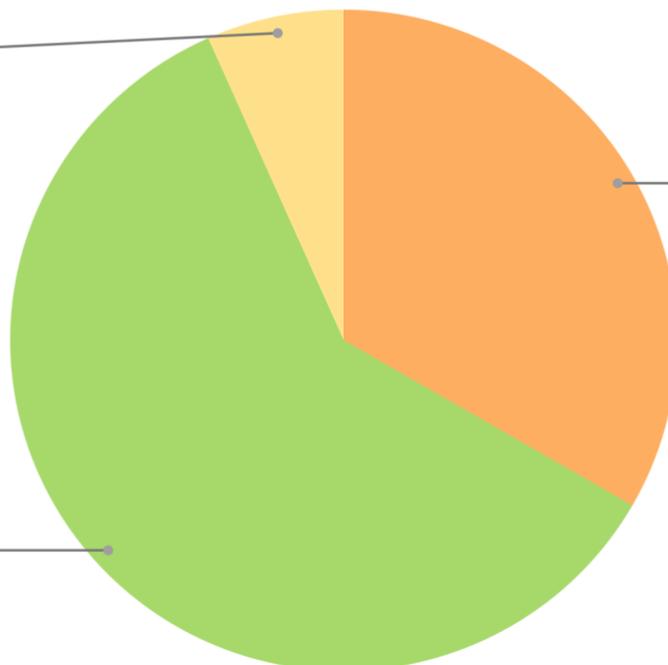
[j] Question from Pandemic Survey 2 about amount of food wasted

Do you think the amount of food you waste is the same or have you realised a change?

I waste more than I  
6.7%

I waste less than I  
60.0%

I waste the same amount  
33.3%



## Want to learn more?

Check out your university's page and get in touch with your Food Waste Watcher! Test yourself on your knowledge with the personalised university food waste quizzes. Check out the other resources too and learn more about how you can help reduce food waste!

[Find Your University](#)

[Other Resources](#)

## Want to get involved?

Want to be involved in your university's strive for zero food waste but can't find your university on the list? Sign up now to be your university's very first Food Waste Watcher! Then take a look at our simple interventions guide that you could kick start at your university canteen.

[Become a Food Waste Watcher](#)

[Simple Interventions](#)

[j] Amended call to action page



Photo by Taryn Elliott on [Pexels.com](https://www.pexels.com)

## Want to Learn More?

Test yourself on your knowledge with the personalised university food waste quizzes.

[Find Your University](#)

Take a look at [Other Resources](#) to learn more about how you can help.

## Want to Get Involved?

Can't find your university on the list but want to do the interventions? Sign up now to be your university's very first Food Waste Watcher!

[Become A Food Waste Watcher](#)



## Appendix B

### TEST QUESTIONS AND RESULTS

#### [a] Observational Notes

[https://drive.google.com/open?id=1oZZZjypILdih\\_i7P6BQxxolj3kDI0FOC](https://drive.google.com/open?id=1oZZZjypILdih_i7P6BQxxolj3kDI0FOC)

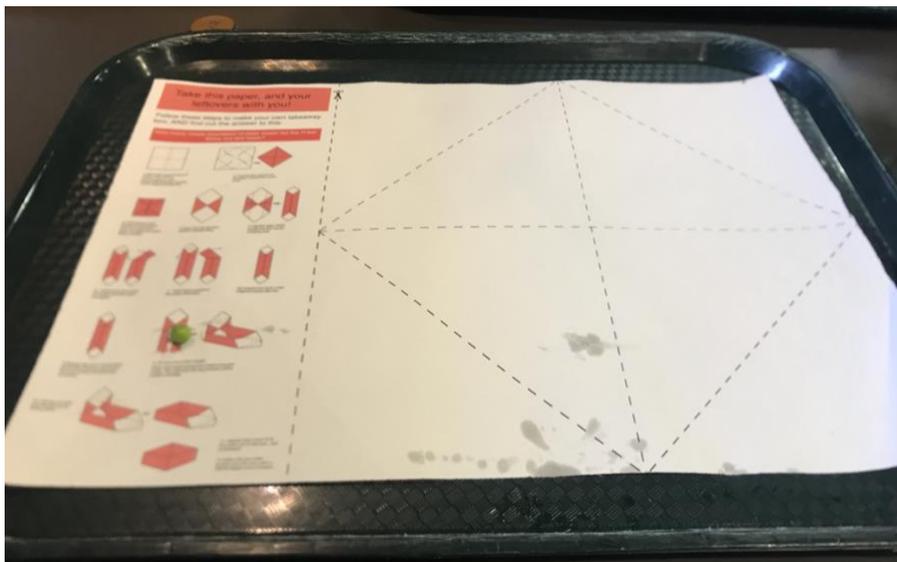
#### [b] Prototype Test Images

##### 1) Prototype Test 1:4/3/2020:

Poster at Queue



Origami Tray Design



2) Prototype Test 2: 11/3/2020:

[Table Talker Arduino Code](#)

Table Talker Prototype



Food Collector Labels



*[c] Campaign Survey Questions and Results*

[https://drive.google.com/open?id=1dOYVaDVHW8oO6i3is9zHQ5\\_17vsf\\_G\\_8](https://drive.google.com/open?id=1dOYVaDVHW8oO6i3is9zHQ5_17vsf_G_8)

*[d] Interview Questions and Notes for Key Stakeholders*

<https://drive.google.com/open?id=1-UHecDi6EKS1YKJQGOhXKJe5oP1GjANU>

- Overall understanding of the campaign and thoughts
- Where do you think the website would be able to live? Just on NUS?
- Where in your university would you see this being able to be advertised
- Do you know groups of students taking on similar roles in uni already? What are their motivations?
- What do you think of the toolkit? Do you think catering would accept them easily?

*[e] Pandemic Survey Questions and Results*

<https://drive.google.com/open?id=1wReIG4ZUOcklD87lTRGavBmHcv6TlPr2>

*[f] Poll Results from Facebook Forum*

[Facebook Forum Link](#)

Poll Result Screenshot

**Naomi Peh Haeger** created a poll. ⋮

★ Admin · March 25 · 📍 Anxieties around food...

Hey! Hope all is well and everyone has more than enough food with them, I'd just like to see what people need in terms of this group, what would you most like to learn/get out of here 😊 Please feel free to add suggestions onto the poll as well!

<input type="checkbox"/> Recipes to make with scrap food Added by you	 +10
<input type="checkbox"/> Tips on how to keep food for longer Added by you	 +10
<input type="checkbox"/> Portion planning/grocery planning tips/tools Added by you	
<input type="checkbox"/> Group virtual cooking sessions Added by you	

Appendix C

INTERVIEW PARTNERS

<i>Name</i>	<i>Title</i>	<i>Company/University</i>	<i>Themes</i>	<i>Date</i>	<i>Participation</i>
Roger Smith	Hazardous Waste Coordinator	Imperial	a	28/1/2020	1
FiFi Henry	ICU Finances and Services Deputy President	Imperial SU	b,c, d	7/2/2020	1
Alison O'gorman	Deputy General Manager	Chartwells @ The University of Sussex	a, b	12/2/2020	1
Jordon Lazell	Research Assistant	Coventry University	b, e	12/2/2020	1, 2
Ailsa Guard	Campaign Project Manager - Citizen Food Waste Prevention	WRAP	b, c, e	2/3/2020	1
Katherine Bojczuk	Sustainability Manager	<a href="#">University of Westminster</a>	b, d	12/3/2020	1, 2
Paul Lickiss	Professor of Organometallic Chemistry, Academic Leader in Sustainability	Imperial	b, d	16/3/2020	1
Thomas Stockton	Sustainability Coordinator	Queen Mary SU	a, b, d	27/3/2020	1, 2
Inga Ryan	Food Service Manager	Imperial		7/4/2020	1.a
Claire Woodhill	Project Manager	Feedback	e, f, g	21/11/2019	1

Participation: (1) stakeholder/primary interview (2) campaign interview (1.a) replied with interest

<i>Themes</i>	<i>Key</i>
Food waste disposal methods	a
Past interventions experience	b
Communication and approval hurdles in university	c
Stakeholders to consider	d
Suggestions in related field	e
Campaign creation insights	f
Values integration	g

*Appendix D*

WEBSITE

<https://foodwastewatch.com/>

TOOLKIT

[https://drive.google.com/open?id=1\\_kSKMYMh5-6yhT79jYEFEdXAEJVrir6](https://drive.google.com/open?id=1_kSKMYMh5-6yhT79jYEFEdXAEJVrir6)