

Ecotopia

Team

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Problem and Solution Overview

According to the US Environmental Protection Agency (EPA), Americans generated an average of 4.38 lbs. of trash per person *every day* in 2012.¹ While some trash can be combusted for energy, the EPA estimates that about 2.9 lbs. of trash are discarded in landfills per person per day, which are highly toxic to the environment because it will take hundreds of years to degrade. Although some corporations such as Google have already provided biodegradable plastics instead of plastic utensils, they actually do not biodegrade any quicker than traditional plastics. Our goals are to increase personal awareness and help users form habits to reduce their waste footprint over time. We decided to implement a mobile app to help shoppers choose eco-friendly alternatives to common trash-producing purchases when making grocery shopping lists, and help motivate users to continue making eco-friendly decisions by showing them reports of their progress.

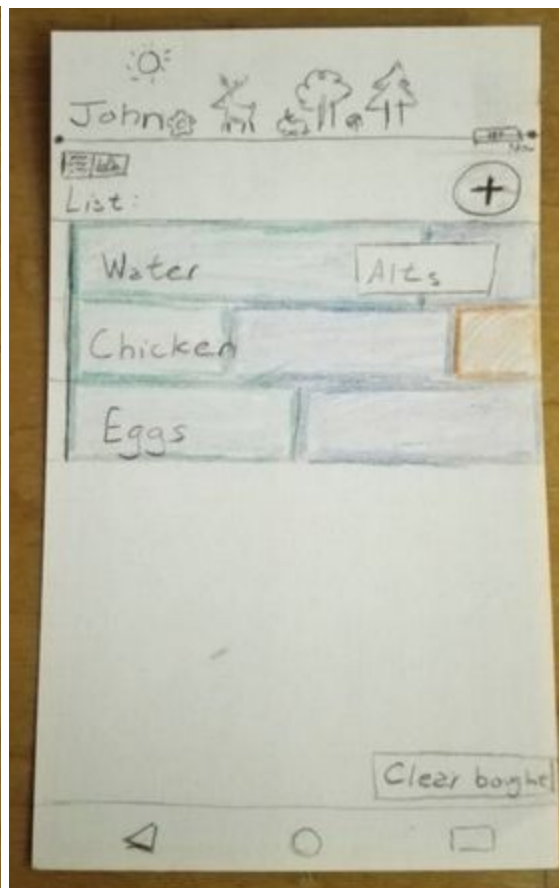
¹ <http://www3.epa.gov/epawaste/nonhaz/municipal/>

Initial Paper Prototype

Task 1: Provide Eco-friendly Alternatives



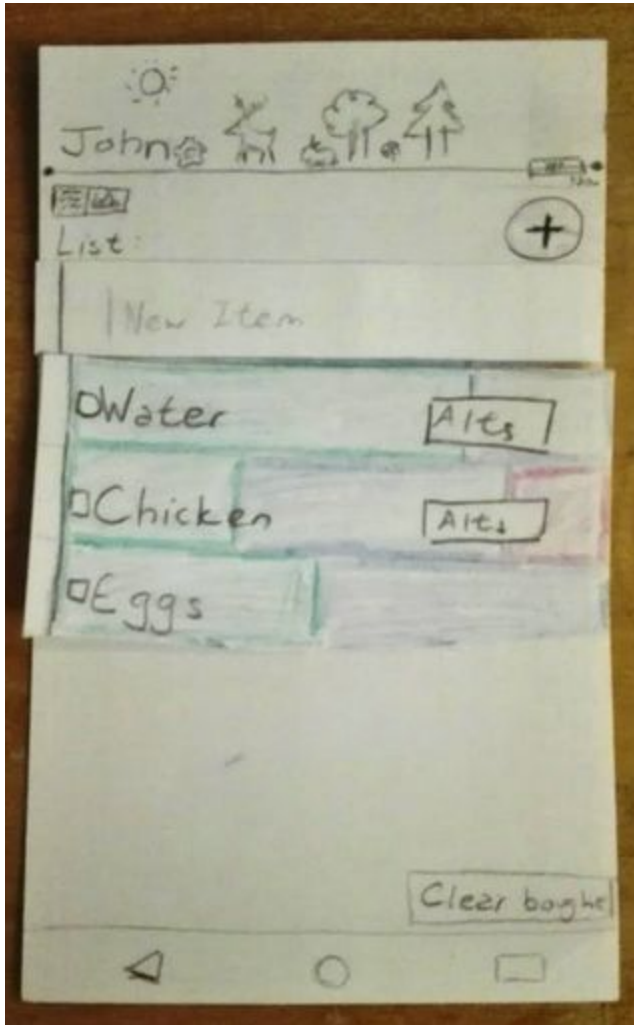
Screen 1.1



Screen 1.2

Screen 1.1: The initial start-up screen to get the user's personalized settings on how far they are willing to travel and how much they are willing to spend on suggestions

Screen 1.2: The home screen showing the user's shopping list



Screen 1.3

Screen 1.3: The user adds a new item

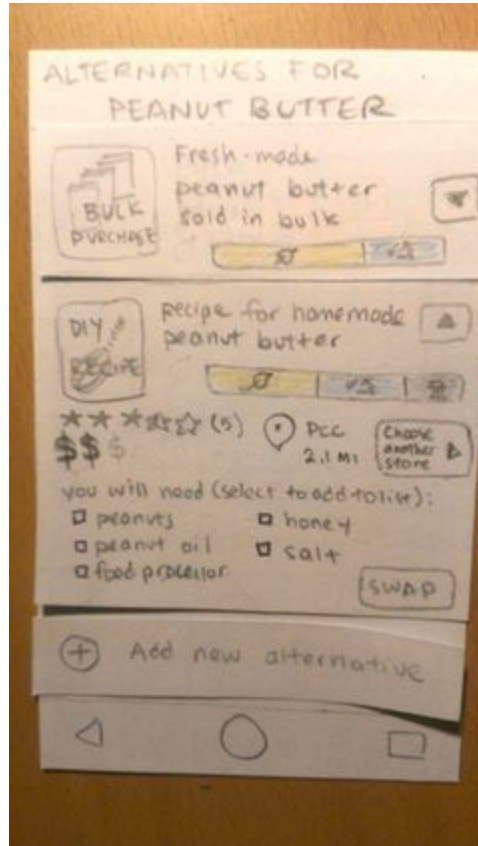


Screen 1.4

Screen 1.4: The user types in the item they want and alternatives are automatically generated. The product is analyzed for its waste value. This product is not eco friendly, the banner at the top degrades a little.



Screen 1.5



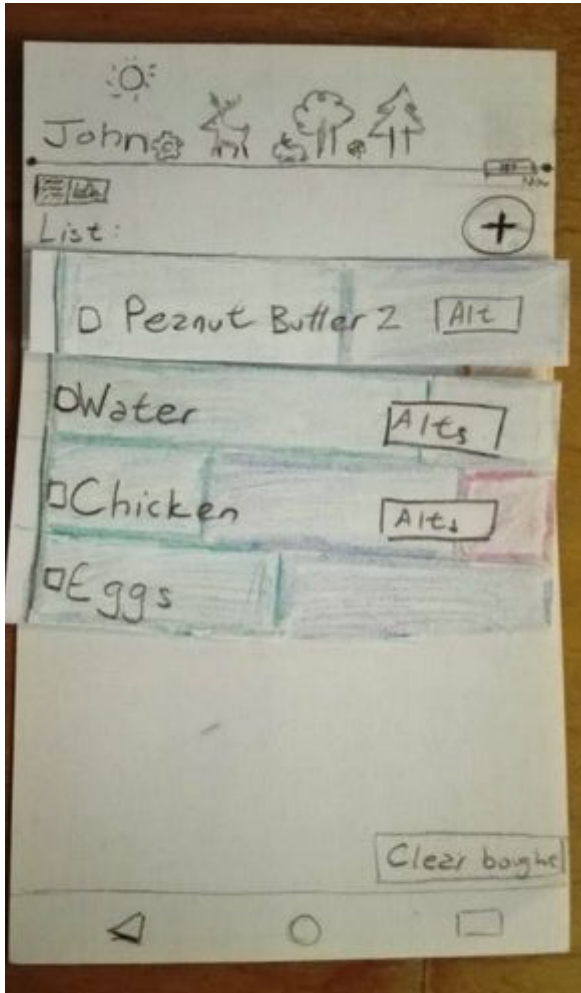
Screen 1.6



Screen 1.8

Screen 1.5: The user can view a list of alternatives. These alternatives may include purchasing a similar item, buying the item in bulk, or making their own. The user can also choose to add their own alternative

Screen 1.6: Tapping on the dropdown menu for an item gives information about the user ratings for this alternative, the price, the location where this item may be purchased, and a list of any additional items the user may need to purchase or bring if they choose this alternative

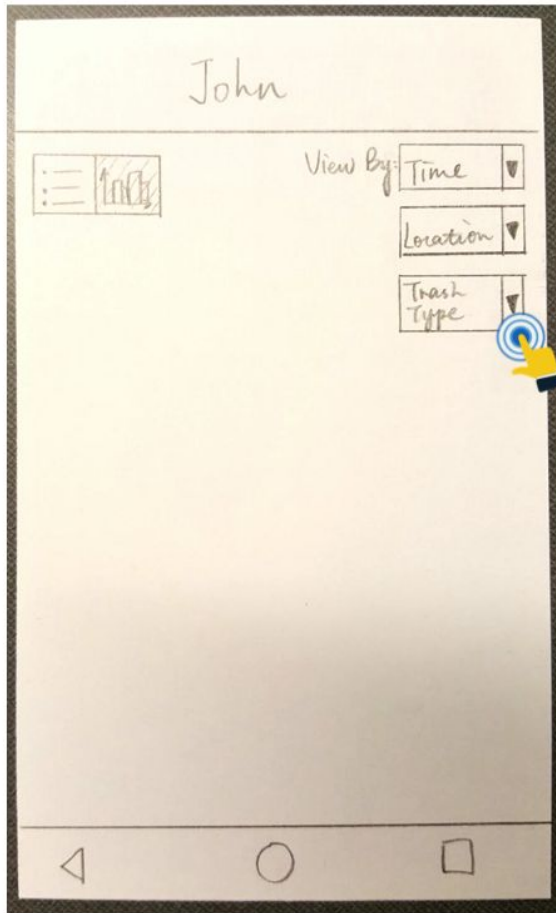


Screen 1.8

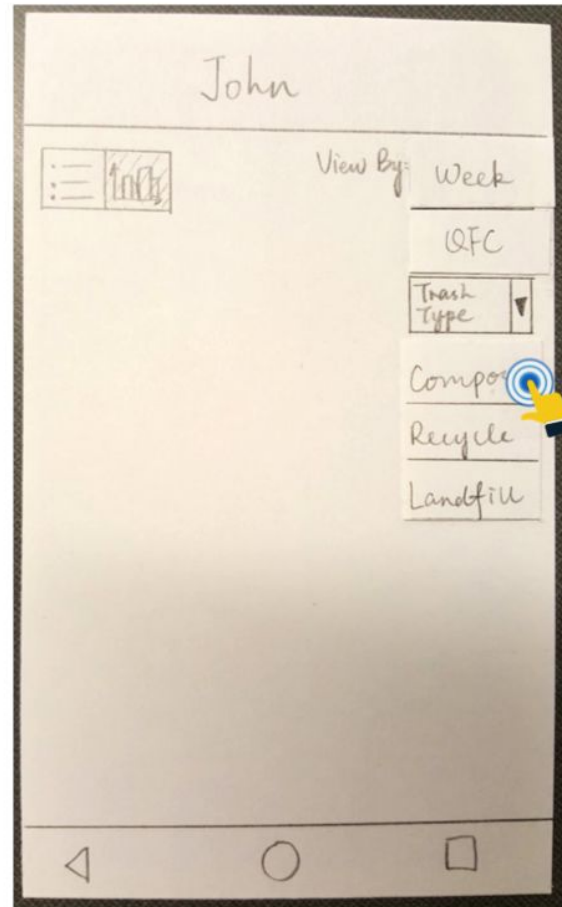
Screen 1.8: The User selects a healthier alternative and the banner at the top gets better

Task 2: Motivate User Making Eco-friendly Purchases

Part of the motivation to keep being eco-friendly comes from observing how banner at the top of a user's shopping list react to items in the user's shopping list (see Screens from Task 1). The user can find further motivation by seeing their progress over time



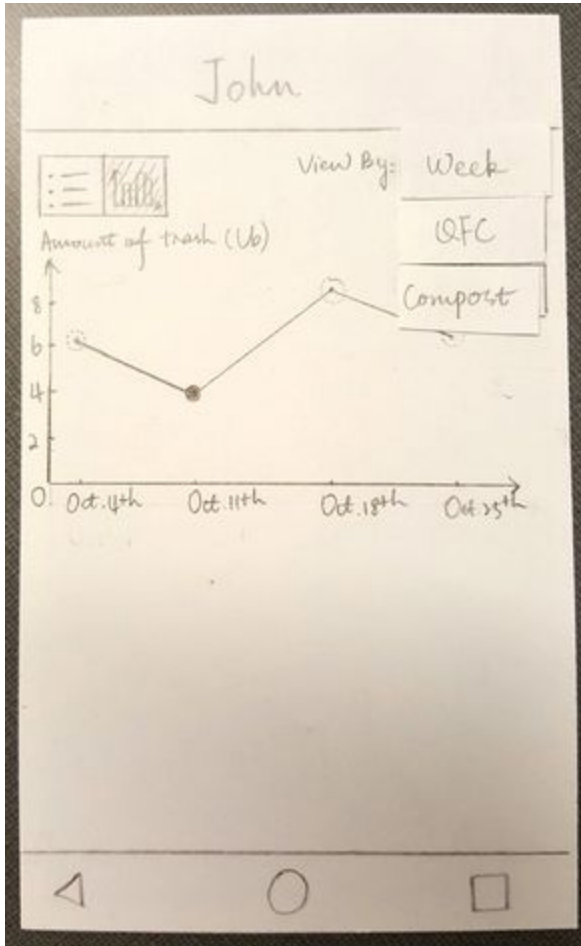
Screen 2.1



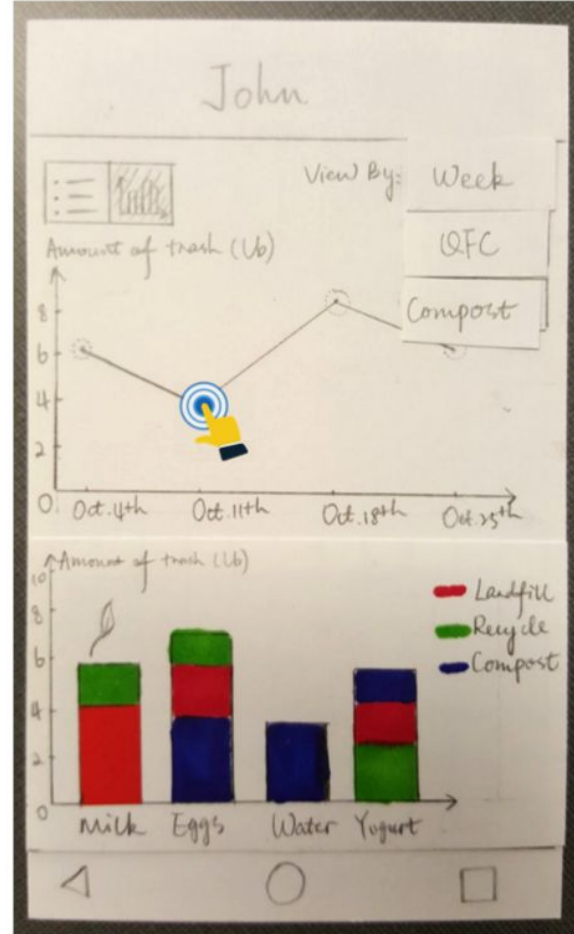
Screen 2.2

Screen 2.1: Initial page for creating the visualization(trend) of trash produce with filters(time, location, and trash type).

Screen 2.2: Users can select filters to create the visualization.



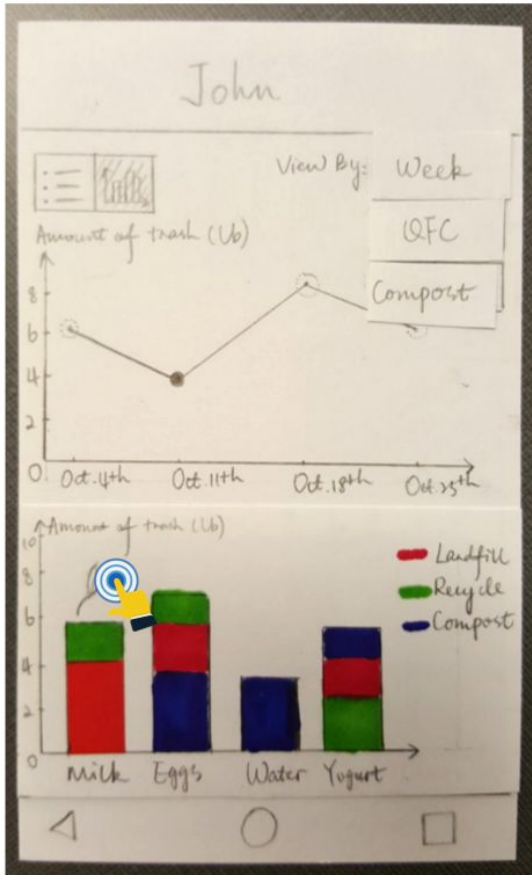
Screen 2.3



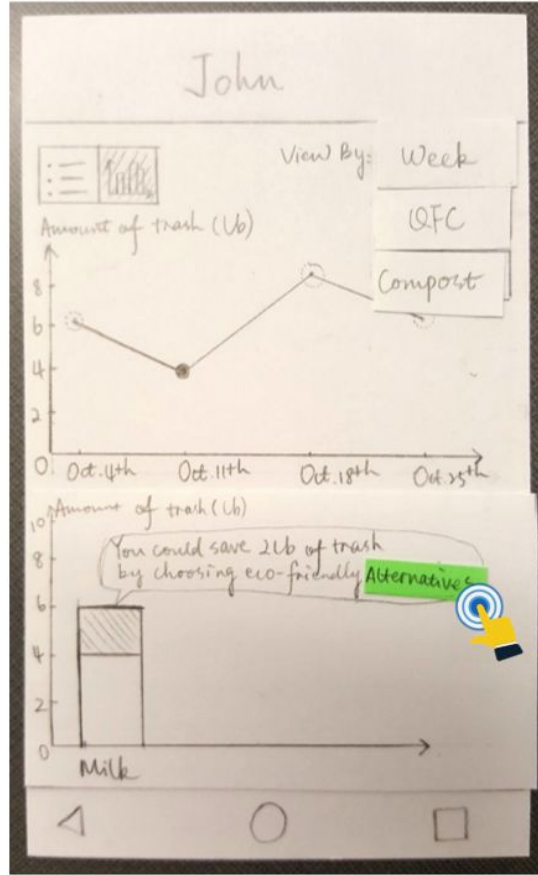
Screen 2.4

Screen 2.3: The week-based visualization about trash produce is created based on filters that the users choose.

Screen 2.4: By clicking the certain point, users can also see the trash produce in different types for the items they bought on the shopping list during certain period of time.



Screen 2.4



Screen 2.5

Screen 2.5: After clicking the leaf icon in Screen 2.4, the visualization changes to the information that users can save certain amount of trash by choosing eco-friendly alternatives. The alternatives is a button which can lead users to the alternatives page.

Testing Process

Methodology

We conducted all of our usability tests in the UW HUB Commuter Commons. We chose the commuter commons because we figured that commuters would be more likely to go grocery shopping (as opposed to eating in the dorms, for ex.). We also thought students are less likely to be seasoned eco-friendly experts, and more likely to be willing to try out new lifestyle changes.

During the test, we gave each participant intermediate sub-tasks for each screen, related to our two tasks of selecting an appropriate eco-friendly alternative, and providing motivation to continue making eco-friendly choices. During the process, we asked them to interpret the elements on a page and explain what certain charts, symbols, or graphs meant to them. Jessica Tsang talked the user through the tasks and asked questions, Jessica Bao helped play the computer and talked the user about the “report” screens, and Jenny took notes and occasionally asked questions during the process. In the first usability test, the questions were leading and too helpful. This was fixed in the latter tests by asking more general questions and give them less leading tasks.

Participants

We conducted our first usability test with “Jim,” a UW student and a math major. Jim was not afraid to ask questions about the wording in our app, but sometimes would not ask about symbols or charts, so we learned to ask questions about what a symbol or chart meant to Jim. From this first test, we learned to improve our testing process by starting with a longer introduction about the problem space, and phrasing our task instructions a bit differently. For example, we learned to start with an explanation of the task and end-goal and see what the user does, but for sub-tasks where we need the user to choose a certain option (because of the limits of our paper prototype), we could phrase the task as “please set a reminder for Monday at 10:30 am” rather than “please set a reminder.”

We conducted our second usability test with “Carly,” a UW student who shops for her own groceries, and is pursuing an environmental degree in Earth and Space Sciences. Like Jim, Carly is representative of our typical user, who will likely be somewhat familiar with composting/recycling/trash, but new to living an eco-friendly lifestyle. Carly mentioned that it would be helpful for her to see the different trash components that make up an item.

We conducted our third usability test with “Fred,” a UW student who is majoring in Women, Gender & Sexuality Studies. Fred shops for his own groceries and also expressed a desire to become more eco-friendly. We discovered later on during the usability study that Fred does not use a smartphone, so this was an interesting test to see if the user could recognize certain symbols. Fred did mention that he would like to see a more direct price comparison of the different alternatives.

Reflections

Usability studies helped us discover the assumptions users made with our visual interface. While designing, the purpose of icons were obvious to us since we were the ones creating it but having someone not know anything about the functionalities made it easier for us to redesign some affordances.

Our testing methodologies improved with every test but due to this changing process, it was harder to discern the factors contributing to user confusion. Our first study taught us more about how to conduct a successful study, our second participant was helpful with smaller details, and the third participant helped us understand confusions surrounding overall interactions.

Testing Results

Heuristic Evaluation Findings and Revisions

Our heuristic evaluation revealed some issues with our reports page and our settings page. On the reports page, the evaluator felt that he was forced to use all the filter dropdowns, even though he only wanted to sort by time. Our solution was to add a checkbox for each filter so that users can have more freedom to select the filters they want.

The evaluator was very confused at the beginning for the initial set-up page. Specifically, the evaluator did not understand what the question “How much are you willing to pay?” meant. He was confused about the intent of the question and were not sure why there was a range bar below. There was also confusion about whether this question was for just one item or all items. In response, we re-phrased the wording and added more detail to the question to be “For one alternative item, how much more are you willing to pay than the one you want originally?”

Usability Test Findings

1. Confusing wording in settings when asked to set budget expectations

Despite our revision, the initial setup page was still confusing to our participants. One participant was still unsure if the question was asking how much he would be willing to pay for a specific product, or if it was talking about expected price differences. In response, we changed the question to be “How much more are you willing to pay for one alternative eco-friendly product?”

2. Trouble understanding trash component charts

One participant easily recognized the symbols for ratings, price comparison, adding a new item etc., but was unsure what the colored bars represented on the alternatives page and the shopping list. He guessed that it was a breakdown of compost vs. recycling based on the symbols used, but was not certain. Our final solution was to add an explanation of the symbols and colors to an initial tutorial.

3. Unfamiliarity with language used in alternatives page

One participant was not sure what a “bulk purchase” was. Our app is designed for those new to eco-friendly living, so we decided that it was very important to clarify or explain this language. Our solution was to add a “?” help button explaining the difference between the types of alternatives.

4. Inconsistent use of leaf symbol

One participant learned from the alternatives page that a leaf symbol symbolized compost, and assumed the same for the leaf on the report page. It was actually a button, but that was not clear given past interactions. We tried shading the bar chart in different ways, and highlighting the bar to make the chart on the report page clickable, but subsequent participants were still unaware of the button. Our final revision was to add a speech bubble button icon with a “...” to indicate more text.

5. “Change Settings” gear icon not visible on Shopping Lists page

One participant was not able to find the gear icon when asked to navigate back to the Settings page, and tried to hit the phone's back button instead. As a revision, the participant suggested grouping the gear icon with other icons (reminder, etc.) on that page.

6. Difficulty expanding alternatives

Two of our participants tried to tap-click on the image icon in the "Alternatives" page to see more details. One participant later noticed the "arrow" button but mentioned that she did not realize it was an arrow at first. Our revision was to make the whole box tap-clickable, and make the arrow more distinct.

7. No close button on help page

One participant noticed that there was no close button on the help page that describes the various types of alternatives. While tapping on the phone's back-button would work, we added an explicit exit button.

8. Drag-to-Trash functionality not clear

Two of our participants tapped on the shopping list item and then tapped on the garbage can icon when asked to delete an item. This would actually mark the item as "bought." The intended functionality was that the user would drag the item to the garbage can. Our revision was to make it so that when the user taps or holds an item, it will pop out and follow the direction of their finger.

Main Revisions after Usability Test

1. Tutorial introduction

We found that some of our participants were confused about what some of the colors and terms in our app referred to, or they had a good guess but weren't certain. Once we explained that the colored bars displayed the trash components of each item broken down to show the ratios of trash, recycling, and compost, the participants seemed to be able to easily remember how to interpret similar metrics. To fix this, we added a tutorial slide explaining how to read the trash component bars.

2. Delete a shopping list item

In our user studies, we discovered that users would like to delete an item from the shopping list without buying it. This led us to creating a trash button on the lower left corner that users could drag and drop the item to, but this was unintuitive. Some of our participants tried to click on an item and then click on the trash to delete; however, in our app, selecting the item in this way actually marks it as bought. To fix this, we needed a way to distinguish between a bought item and an item marked for deletion.

3. Help page

Most of our users didn't understand the meaning of icons on the alternates page. The icons did have smaller words labeling it but the exact definition and category of the icons were vague. By adding the help page, users can understand a more in-depth description on what the alternate choices were and why they are eco-friendly.

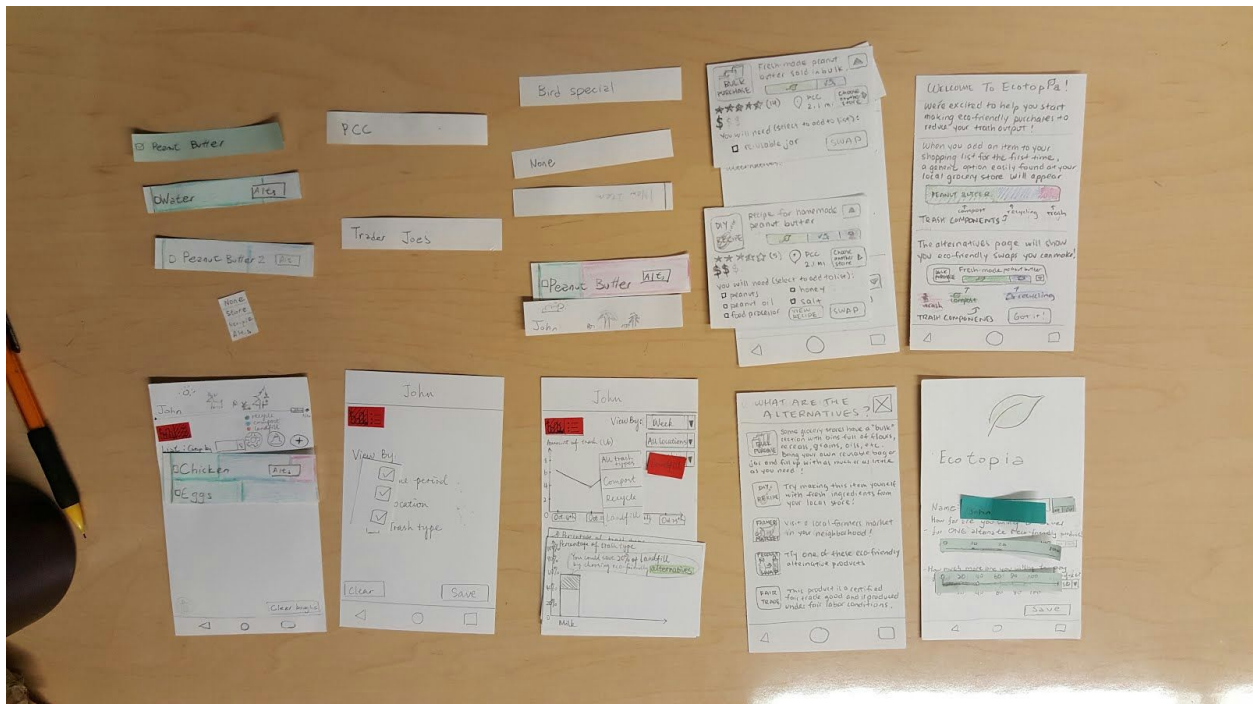
Design Critique Findings

The critique revealed that the initial setup page was still confusing so we removed it. Asking users about their budget was also a bit misleading, as it implied that an eco-friendly lifestyle is more expensive, though many bloggers have noted the opposite is true. A couple suggestions were made to increase the spacing between drop-down menus and the size of some icons. These have been

incorporated in the final mockups. Lastly, we had a discussion about the delete function, which was still deemed confusing. We have changed the delete button to be an “edit” button, which takes the user into a different screen where they can tap to delete an item.

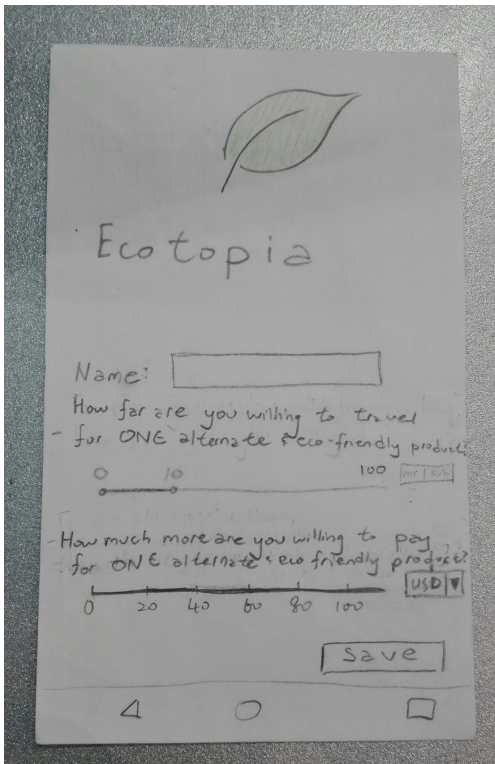
Final Paper Prototype

FINAL PAPER PROTOTYPE OVERVIEW

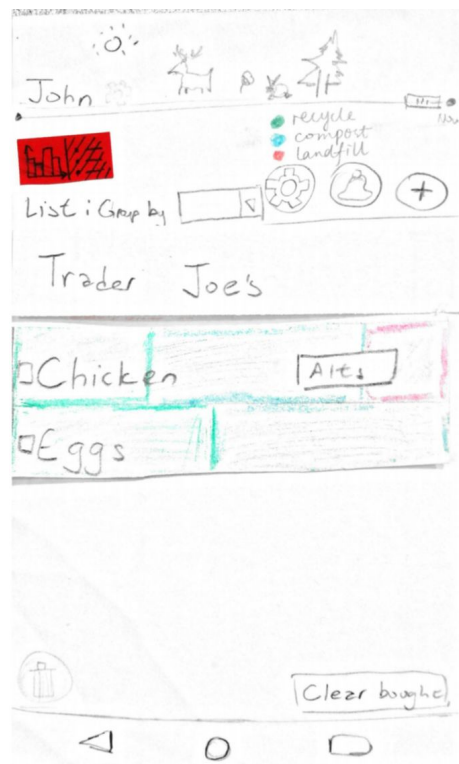


WALKTHROUGH

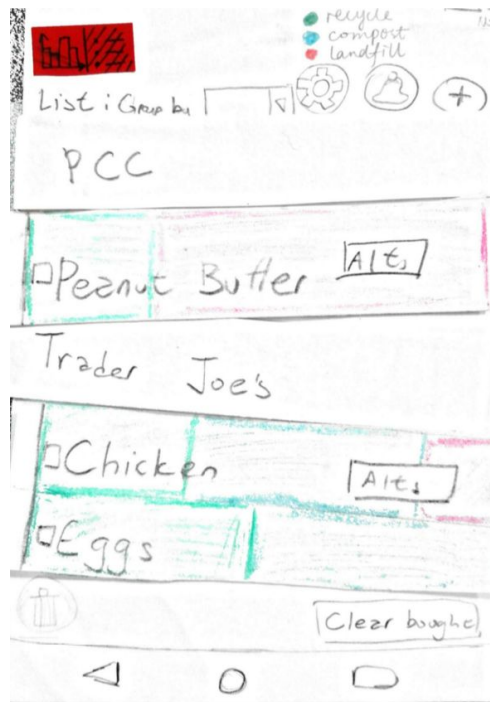
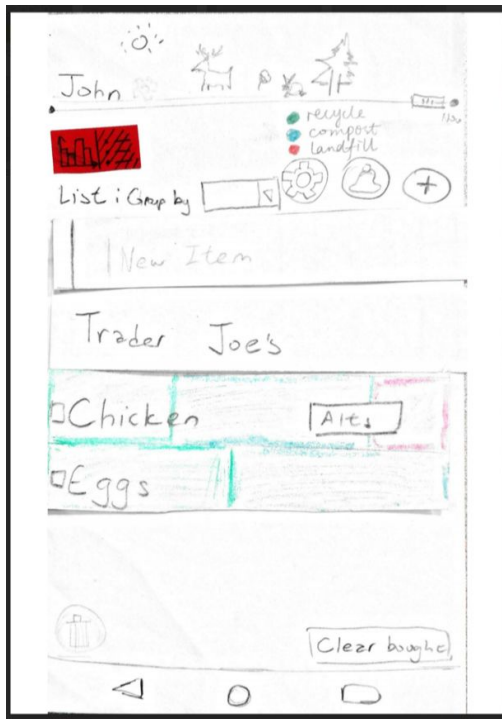
Task 1: Alternatives



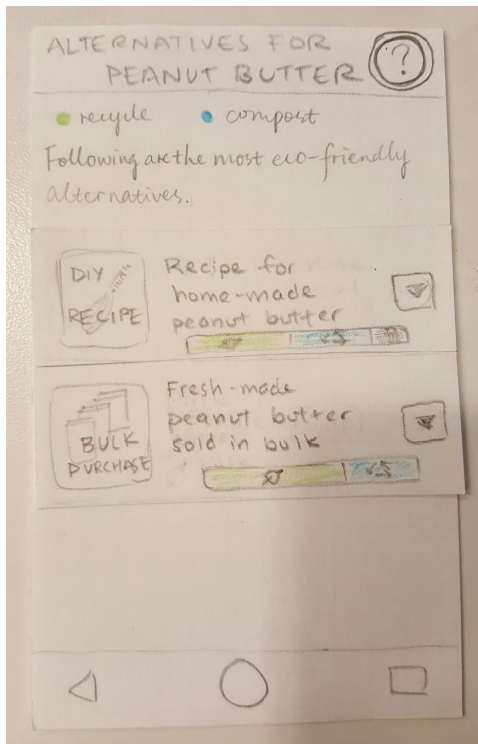
Screen 1: Setting



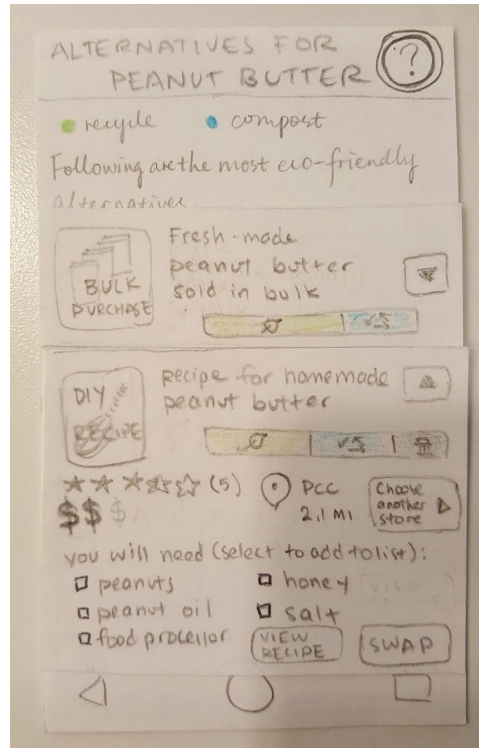
Screen 2: Homepage shopping list



Screen 3: Add a new item in the list

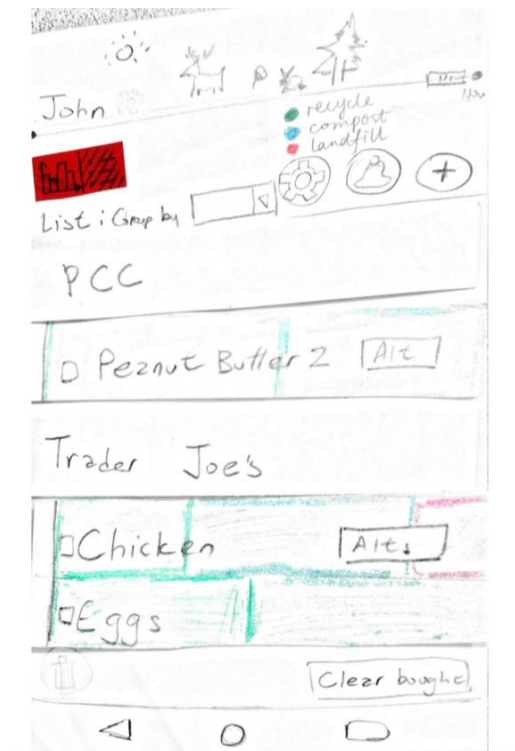


Screen 4: Sort the list by store



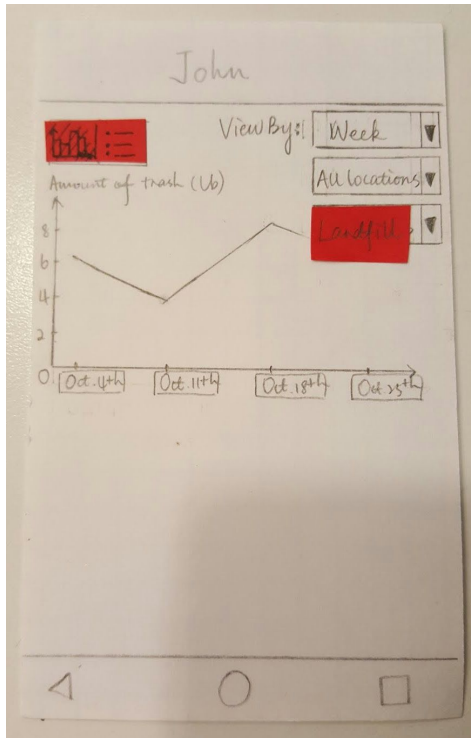
Screen 5: Provide alternatives summary

Screen 6: See the alternatives detail

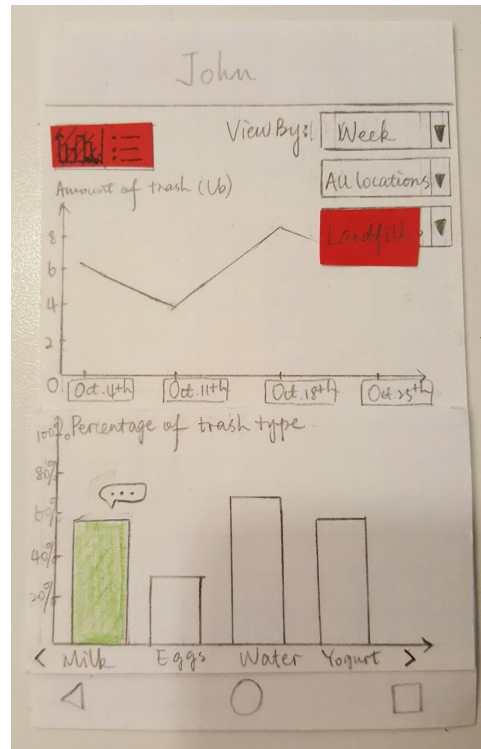


Screen 7: List updated

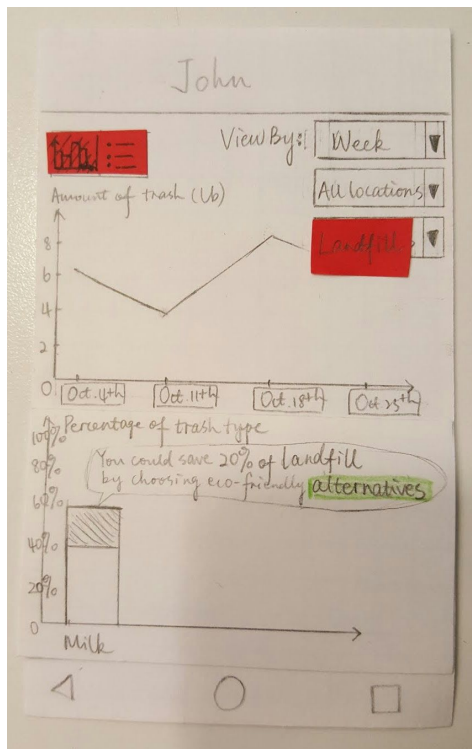
Task 2: Motivation



Screen 1: Provide trash trend through filters



Screen 2: See trash details of specific date

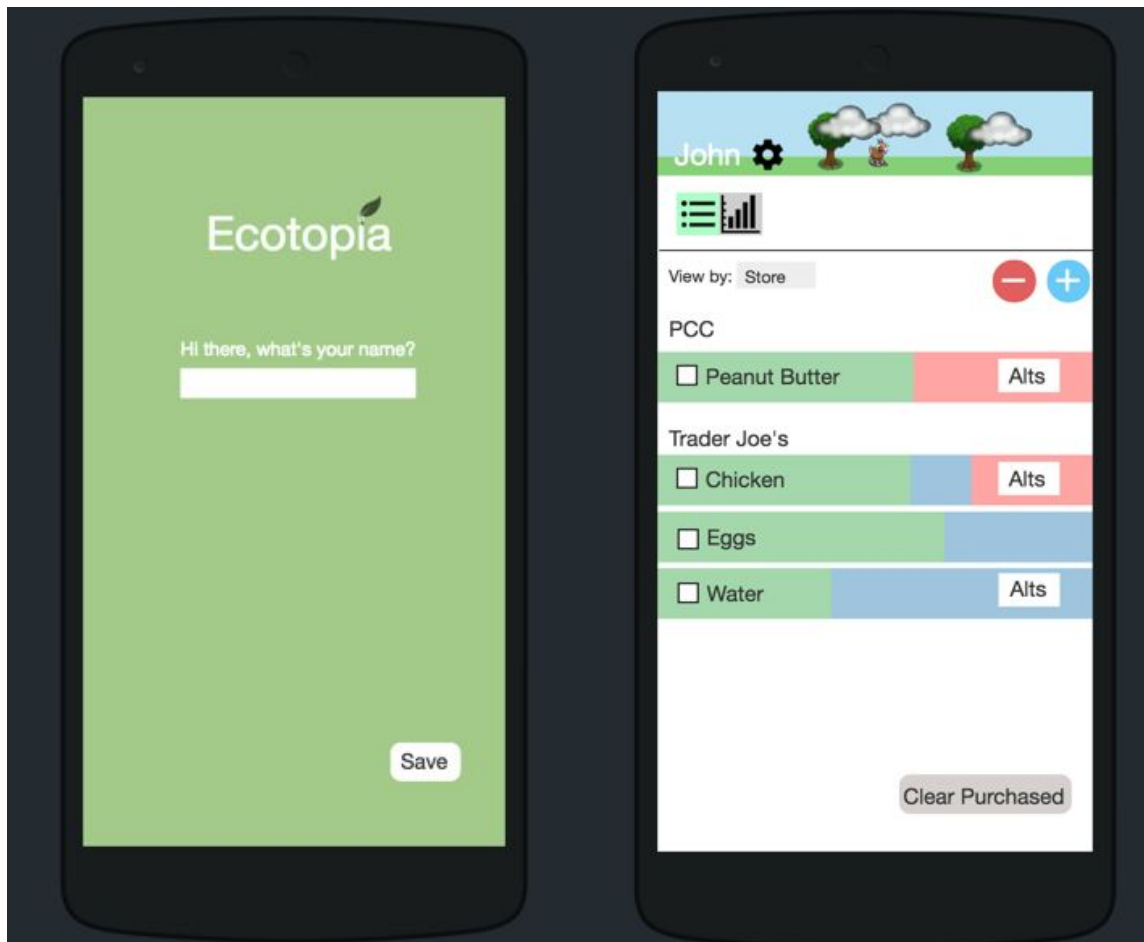


Screen 3: Show effect of alternatives

In the final design, consistency issues were fixed and the program flow was made easier to follow. Some icons were hidden affordances so we made them more obvious to interact with.

Digital Mockup

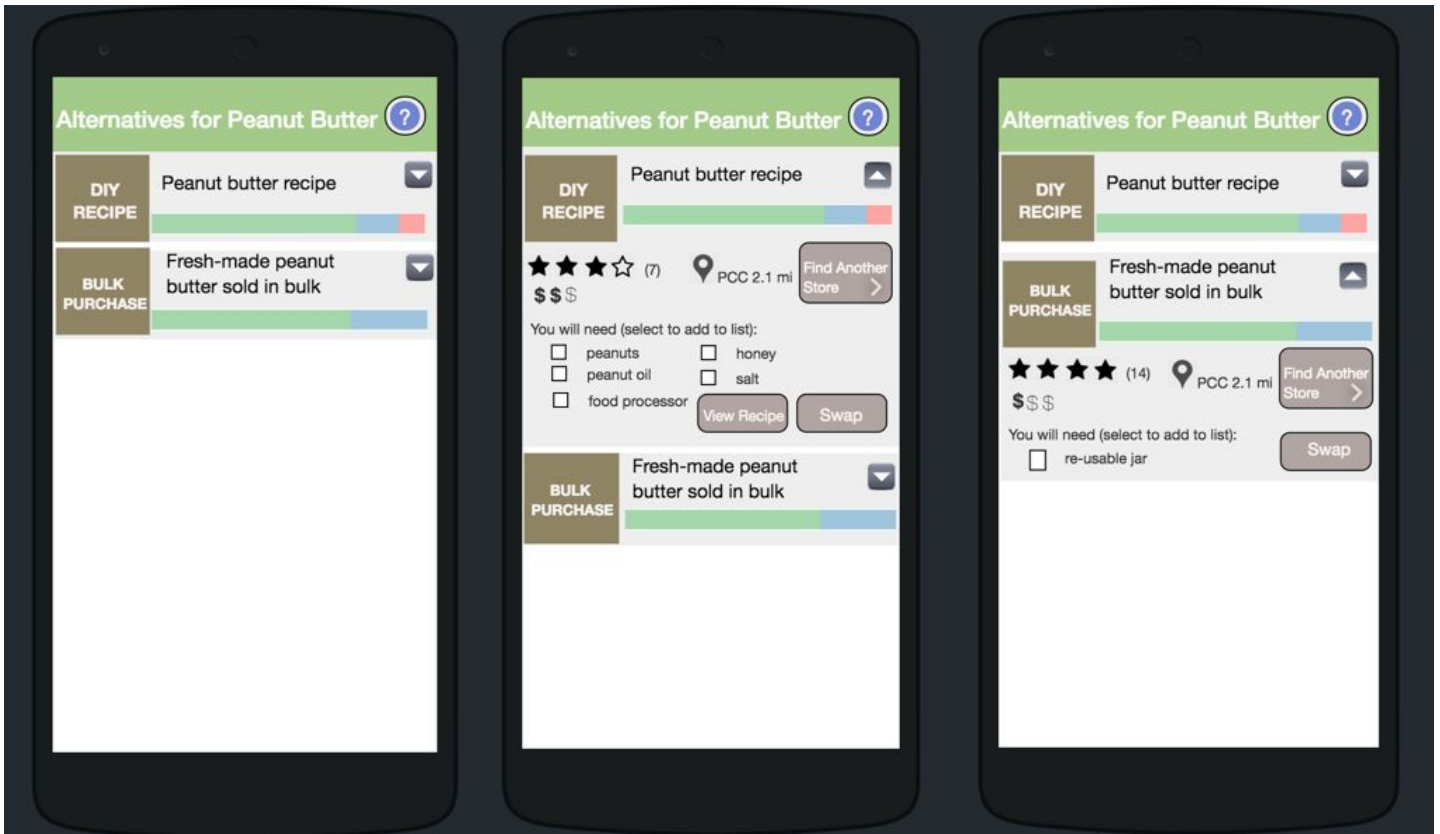
Task 1: Alternatives



Screen 1: Settings page

Screen 2: Homepage Shopping List

The initial set-up screen allows the user to enter their name. The homepage shows them their current shopping list. If the product contains trash components, the environment in the banner at the top degrades a little.

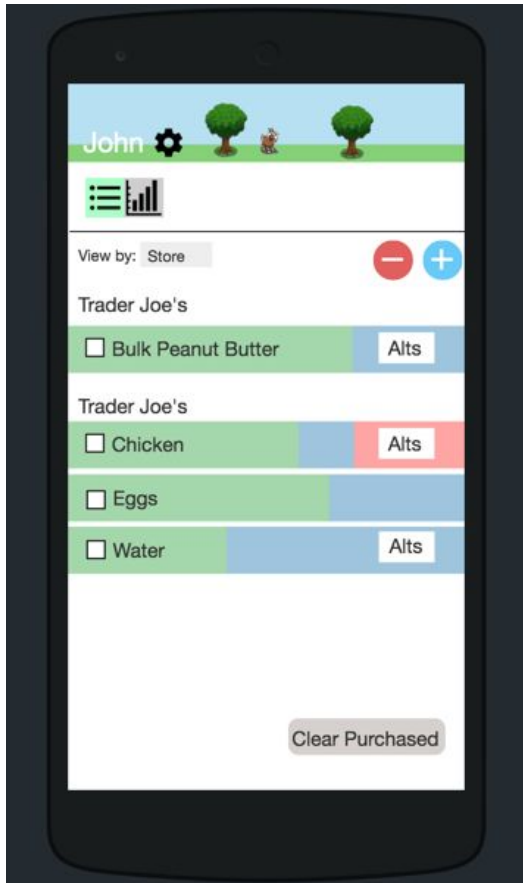


Screen 3: View alternatives

Screen 4: View details (recipe)

Screen 5: View details (bulk)

The user can view a list of alternatives. These alternatives may include things like purchasing a similar item, buying the item in bulk, or making their own. Tapping on the dropdown menu for an item gives information about the user ratings for this alternative, the price, the location where this item may be purchased, and a list of any additional items the user may need to purchase or bring if they choose this alternative



Screen 6: Post-swap

When the user selects an eco-friendly alternative, the banner at the environment in the banner at the top gets a little healthier. This ties in closely with our Task 2: motivate.

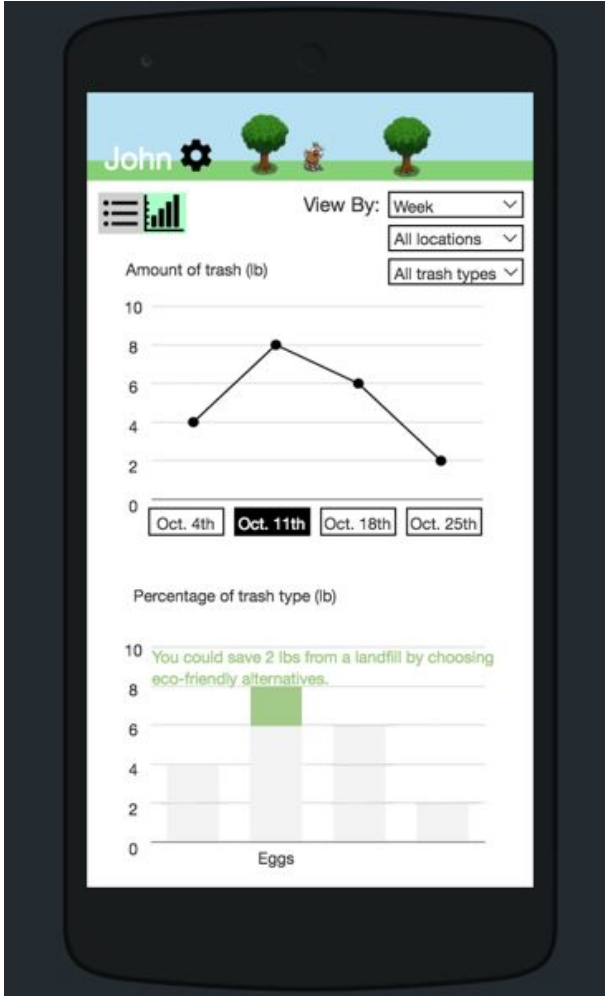
Task 2: Motivate



Screen 7: View trash produce history

Screen 8: View trash produce at specific date

The trash history page allows users to track their trash footprint overtime based on the filters of their choice, such as time period, grocery store location, and trash type. The default graph is viewed with all locations and all trash types, which gives users a general idea of their overall trash production, after which they can customize the results based on their preferences. By clicking on the specific date, users can have a clear understanding of the specific amount of trash produced for each item in the shopping list on that date.

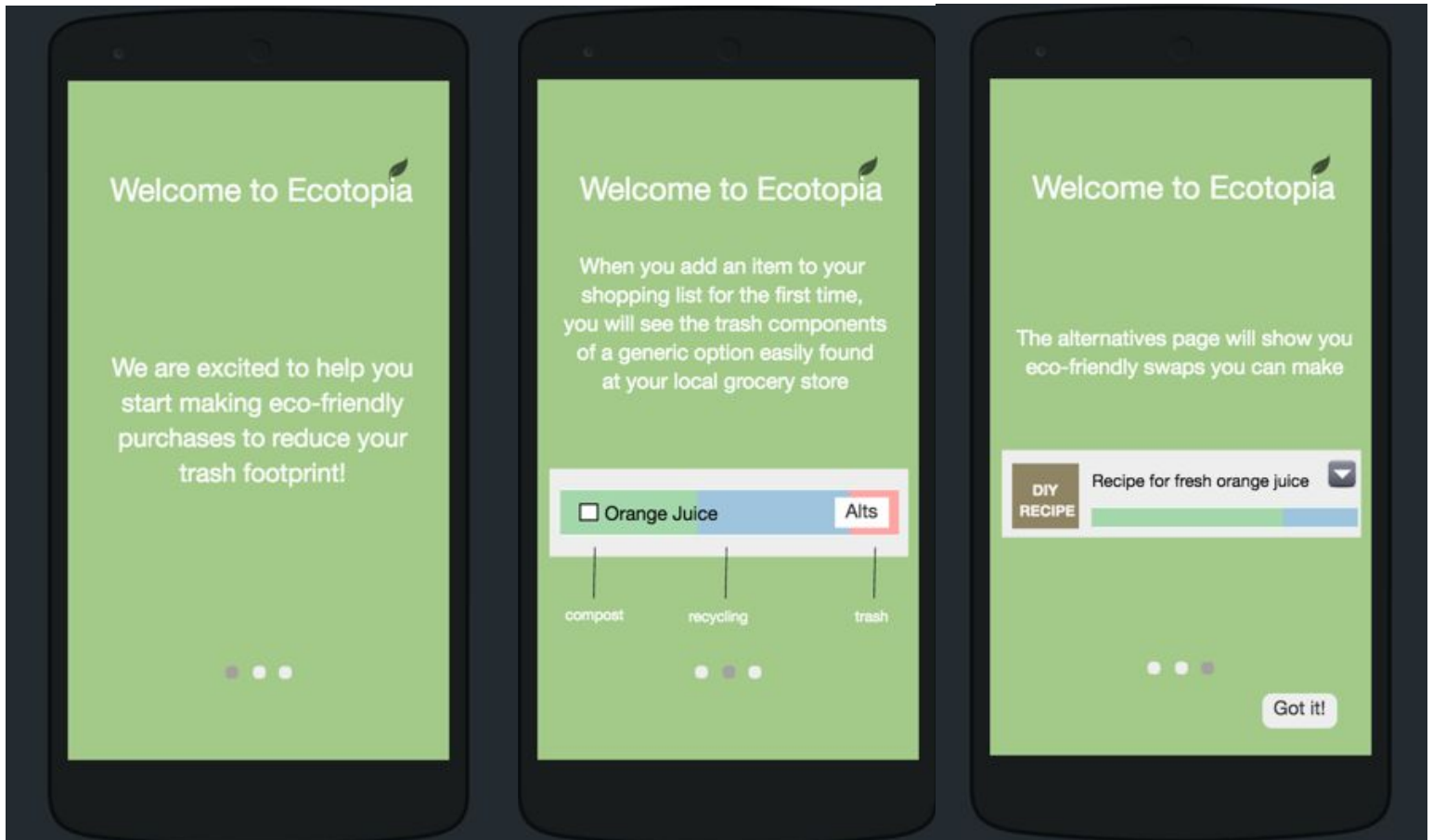


Screen 9: Motivate users have eco-friendly purchase

By clicking “more info” on screen 8, users will be able to see the potential amount they could reduce their trash if they choose to purchase eco-friendly goods.

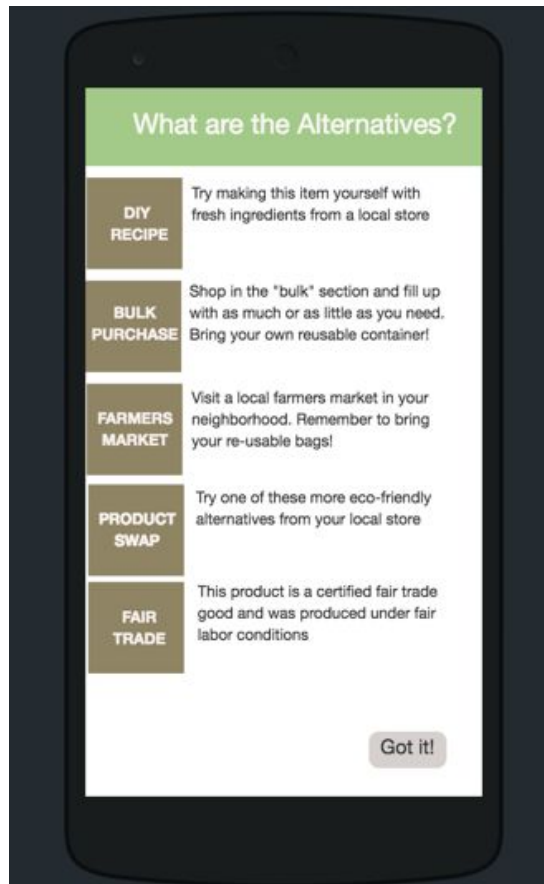
Added Features

Tutorial for new users



In response to our usability tests, we added a tutorial screen at the beginning of the app to introduce the purpose of the app and also explain in more detail what some of the colored bars represented. In our paper prototype, these tutorial screens were condensed into a single page, but this made the page very dense and cluttered. In our digital mock-up, we split the tutorial into three separate screens as shown above.

Help understanding alternatives



Between our usability tests, we also added a help screen to our app to explain to a new user what the different alternatives in our app mean. This was important our app targets users who are new to eco-friendly living, and we found during our study that there was a lack of knowledge about what an eco-friendly lifestyle may entail. The biggest change here was the addition of an explicit exit button ("Got it!") which mirrors the exit button in our tutorial.

Discussion

We found the process of iterative design to be very helpful because it allowed us to make incremental changes and quickly assess how effective those changes were. The iterative nature of the design process gave us the ability to make quick changes, which helped us to not get too attached to a particular display or affordance, and allowed us to experiment with different approaches (such as with the “see more info” type button in our report that evolved quite a bit throughout the design process).

We simplified our tasks a bit over the course of our usability tests. Originally, when a user suggests an eco-friendly alternative that requires them to bring their own reusables (i.e. reusable jars or bags), we had screens and buttons to allow a user to set reminders to bring those reusable goods with them when shopping. However, we decided to focus our tasks to just the process of selecting an alternative and viewing the overall results because we found that users had the more trouble with these tasks than with setting a reminder, and as these are the main tasks, we wanted to iterate on our designs as quickly as possible.

Having a heuristic evaluation, three usability tests, and design critiques in-between was a good number of iterations for us. Having the three usability tests and spacing them out enough to make small edits in-between each test was very useful to get immediate feedback on quick revisions of our prototypes. Some crucial missing features surfaced during these tests that inhibited the user’s workflow using our app, such as the lack of a delete button for shopping list items, or the lack of a “close” or “back” button for certain screens. It might have been helpful to have one more usability test with our digital mockups to see if some of the issues with users not recognizing that certain icons were buttons was fixed by having a more polished prototype.