

# PlanetFlip: Green Travel

Making climate action fun and engaging

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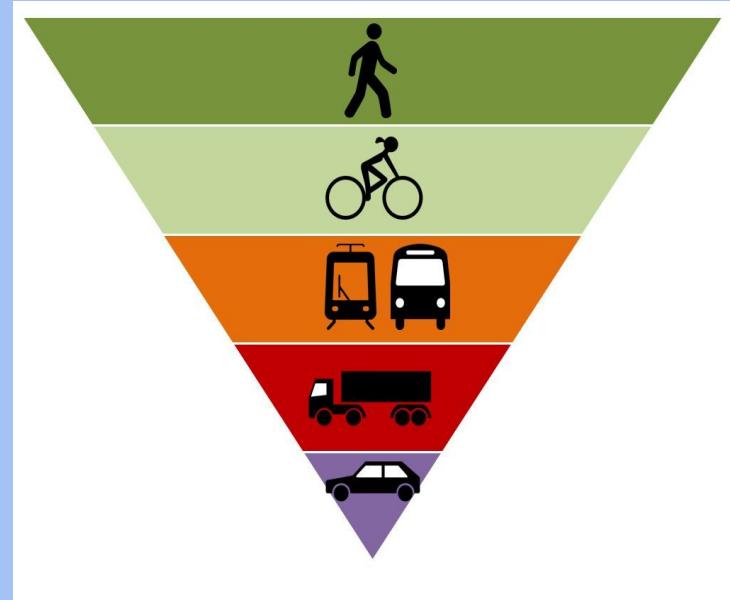
A pixel art landscape featuring a blue sky with white and light blue clouds. In the foreground, there's a green grassy field with brown dirt patches. On the left, a brown tower with an orange conical roof stands on a mountain peak. A single green tree with red flowers grows on another mountain. On the right, a tall brown castle tower rises from behind a mountain. Between the towers, two more green trees with red flowers are visible. The background consists of several layers of blue and teal mountains under a clear blue sky.

# 01

## Background & Context



**How many of you use alternative modes of transportation besides cars to get to school?**



Why is commuting important?





**How might we gamify commuting  
so that users are more aware  
of their transportation  
choices and corresponding  
environmental impacts?**

# Our Stakeholders



**Green New Deal,  
Emma Rodriguez**

Grassroots organization fighting  
for action against climate change,  
GND representative



**PlanetFlip,  
Ron Kagan**

Project lead of mobile app that  
helps build community action  
towards climate change



**Professor  
Anh-Thu Ngo**

END100D professor overseas  
and teaches sustainable design  
techniques for project

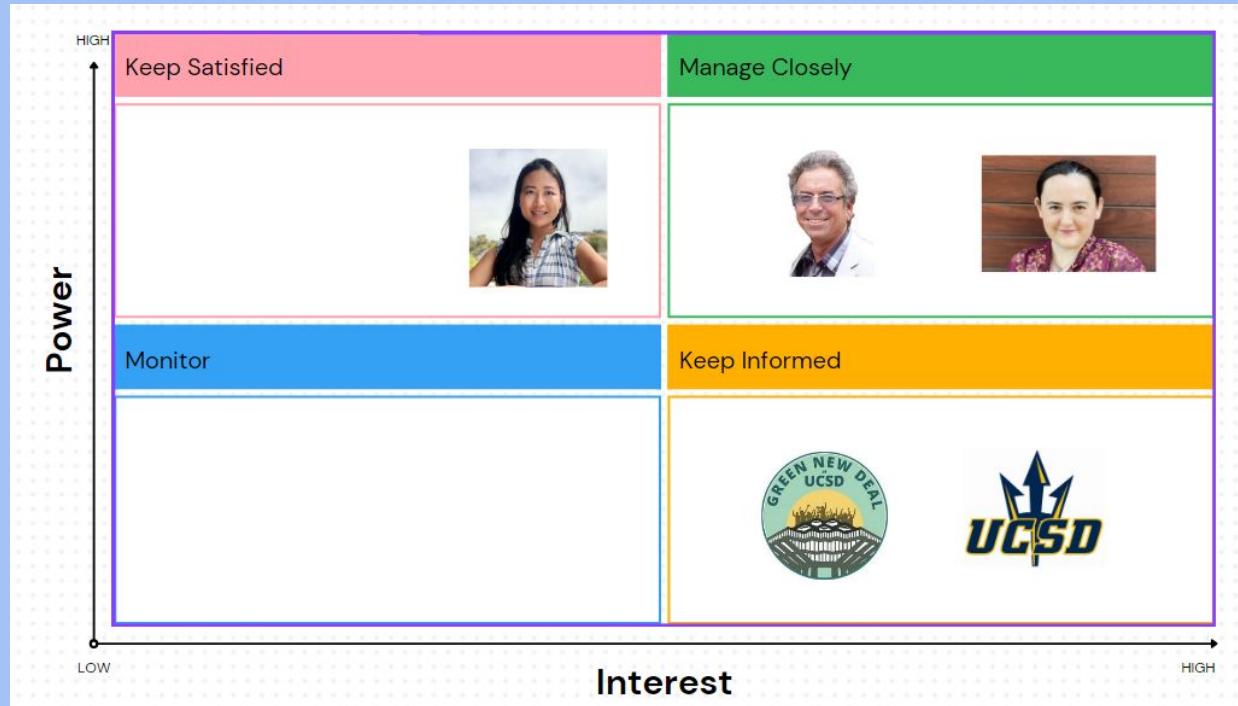


**UCSD  
Community**

Game users, climate  
change activists



# Stakeholder Map



# Previous Team



?

Welcome to Green Travel!

Using different modes of transportation will take up different amounts of fuel and time.

- Biking (Default):
  - 12 minutes per block / 0 fuel per block
- Bus:
  - 5 minutes per block / 15 fuel per block
  - Can only go to and from bus station
- Trolley:
  - 7 minutes per block / 10 fuel per block
  - Can only go to and from trolley station
- Car:
  - 3 minutes per block / 25 fuel per block

Get to your final destination under the time limit while using less than the allotted fuel.

[Play!](#)

?

Current Time: 9:30 AM  
End Time: 9:30 AM  
Fuel: 120/300

[Undo Path](#)  
[Execute Path](#)

[Play!](#)

?

Current Time: 9:30 AM  
End Time: 9:30 AM  
Fuel: 120/300

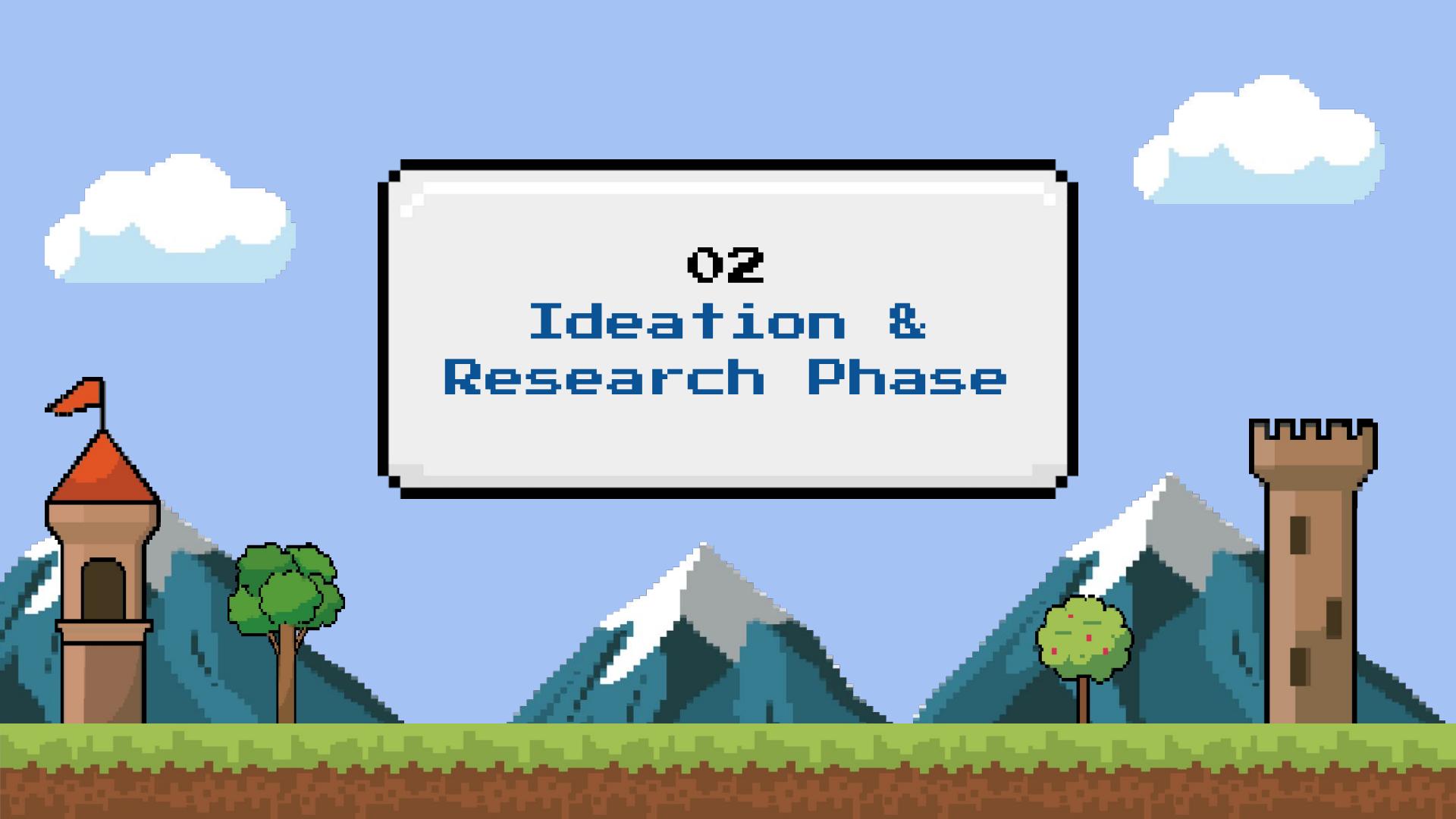
[Undo Path](#)  
[Execute Path](#)

Congrats! You did it!

Did you know that the trolley has reduced San Diego's emissions by 97,000 metric tons?

[Next Level](#)





A pixel art landscape featuring rolling green hills at the bottom, snow-capped mountains in the middle ground, and two towers: one with a red roof on the left and one with a brown roof on the right. Two white clouds are visible in the blue sky above.

## 02 Ideation & Research Phase

# Our Journey

01.

## Research

Prior work, stakeholder interview, existing solutions

03.

## Designing on Figma

Creating prototype screens and visual designs of game

05.

## User Testing

Sending out surveys, discuss findings

Research

Ideation & Sketching

Designing

Coding

User Testing

02.

## Ideation & Sketching

Exploring ideas, sketching ideas to discuss and finalize

04.

## Coding on Construct 3

Taking designs on Figma and converting to Construct 3, coding button interactions and routing





# Insights from a GND Representative

## Goals for UCSD GND

Increase member engagement,  
teach people how to participate  
in climate action



## Target Audience

Students, Alumni chapter,  
faculty/staff, the UCSD  
community



## Our Goal

Create a game that teaches  
what it means to do climate  
action



## Long Term Goal

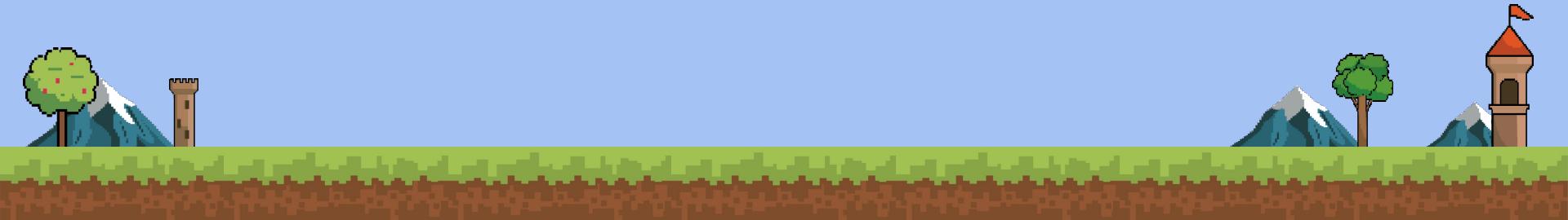
Game can be used for/by  
other student organizations  
aside from GND





How might we gamify commuting so that users are more aware of their transportation choices and corresponding environmental impacts?

**The UCSD Green New Deal organization needs to implement a playable game into the PlanetFlip app that is entertaining and educational in order to encourage users to be climate conscious through their commute.**



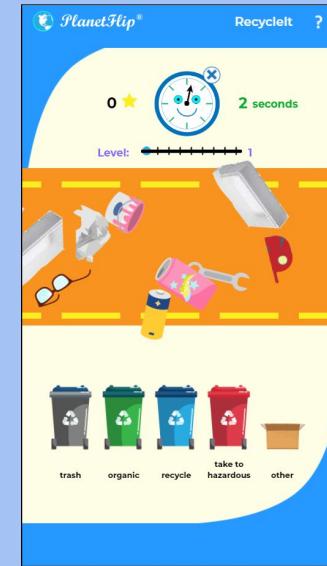
## Secondary Research: Existing Solutions



Mini Metro



Flow Free



RecycleIt!

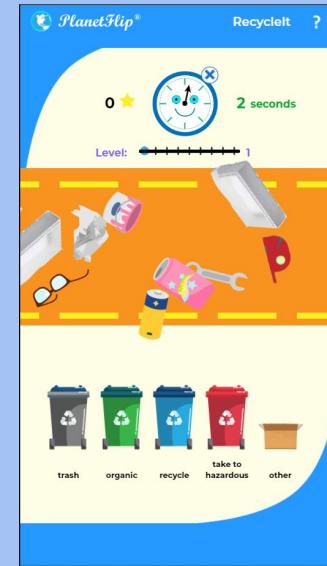
## Secondary Research: Existing Solutions



Mini Metro

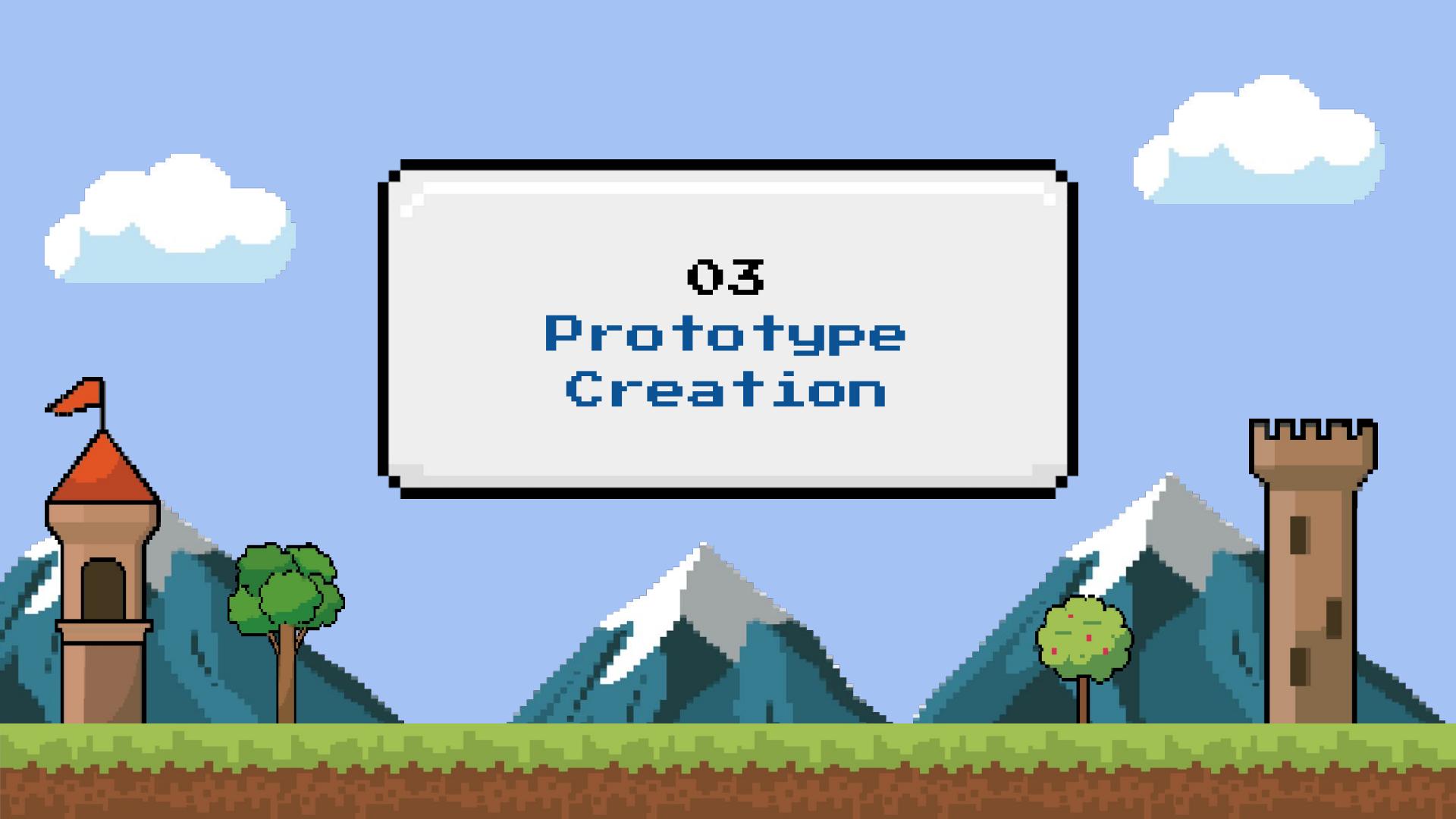


Flow Free



RecycleIt!

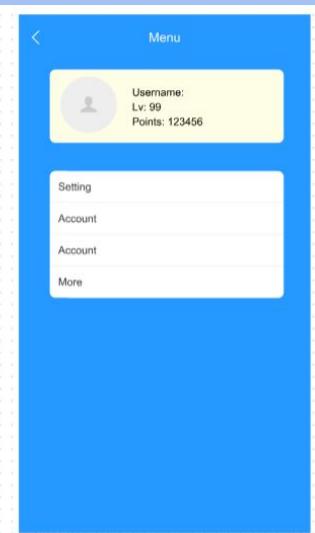
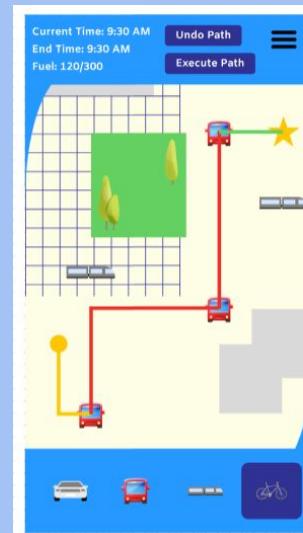
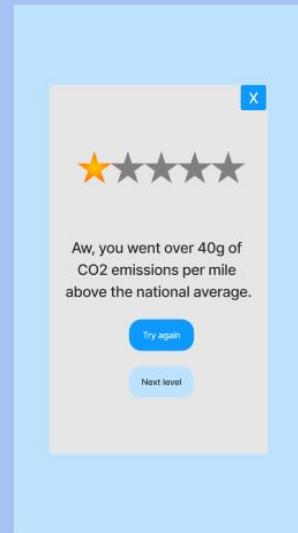
Weighted Decision Matrix							
Criteria	Weight	Pixelated Setting	Realistic Setting	Fuel Limit	Emissions Bar	Expansive Map	Static Map
Usability	4	0	0	-	+	-	+
Producibility	2	+	-	0	0	-	+
Desirability	4	+	-	-	+	+	-
Feedback	1	0	0	+	+	0	0
Suitability	3	-	+	-	+	+	-
<b>Total</b>		1	1	-2	4	0	0
<b>Weighted Total</b>		6	3	-10	12	1	-1



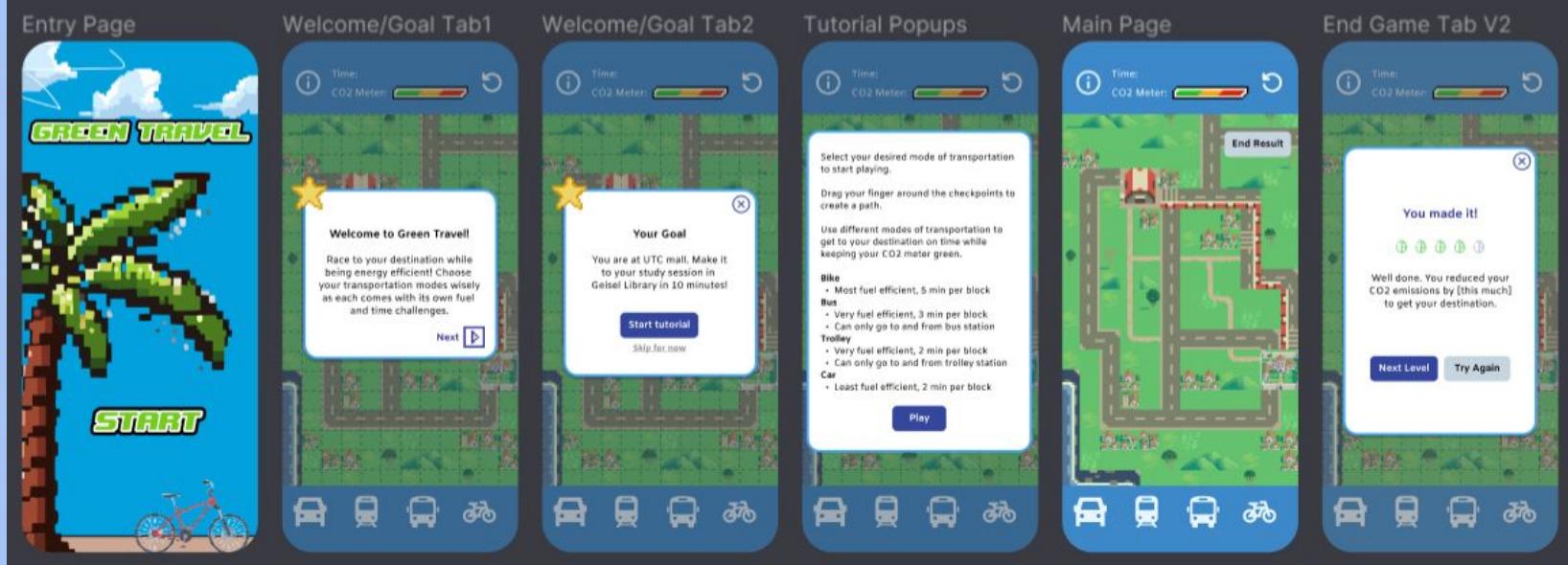
A pixel art landscape featuring a blue sky with white and light blue clouds. In the foreground, there's a green grassy field with brown dirt patches. On the left, a brown tower with an orange conical roof stands on a mountain peak. In the center, a large, dark blue rectangular sign with a black border and a small gray base is centered. On the right, another brown tower with a blue conical roof is visible. Two green trees with red flowers are positioned on the left and right mountain peaks.

## 03 Prototype Creation

# Exploring Ideas: Sketches



# First Figma Prototype





# First Construct3 Prototype



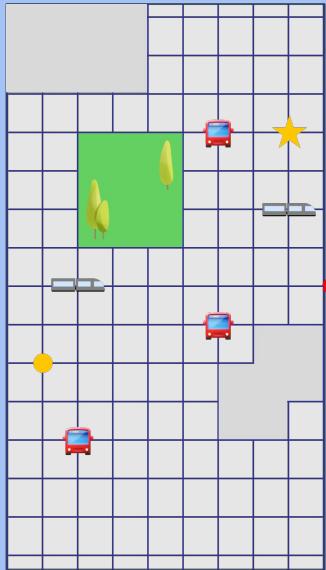


## Considerations and Feedback

- Align map with the San Diego map, similar routes
- Give players goals to start
- Expanded map, more stops
- Ability to enlarge or reduce the map
- Maybe not fuel tank and monetary costs



# Map Iterations



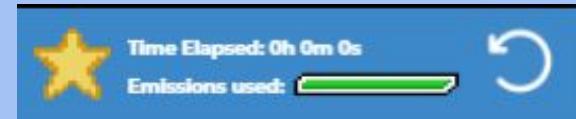


# Top Bar Iterations



Current Time: 8:06 AM  
End Time: 9:30 AM  
Fuel: 300/300

Undo Path  
Execute Path





# Tutorial Iterations



Welcome to Green Travel!

Using different modes of transportation will take up different amounts of fuel and time.

Biking (Default):

- 12 minutes per block / 0 fuel per block

Bus:

- 5 minutes per block / 15 fuel per block
- Can only go to and from bus station

Trolley:

- 7 minutes per block / 10 fuel per block
- Can only go to and from trolley station

Car:

- 3 minutes per block / 25 fuel per block

Get to your final destination under the time limit while using less than the allotted fuel.

**Play!**



Select your desired mode of transportation to start playing.

Drag your finger around the checkpoints to create a path.

Use different modes of transportation to get to your destination on time while keeping your CO2 meter green.

**Bike**

- Most fuel efficient, 5 min per block

**Bus**

- Very fuel efficient, 3 min per block
- Can only go to and from bus station

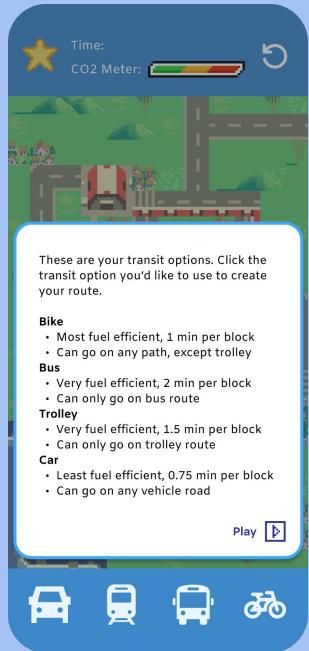
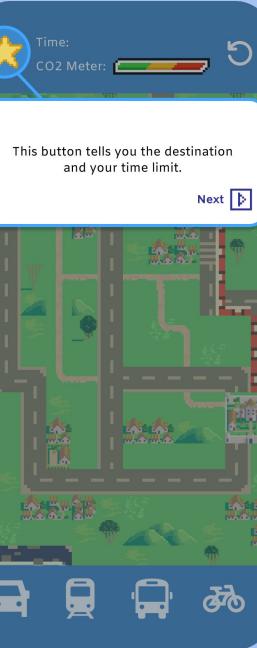
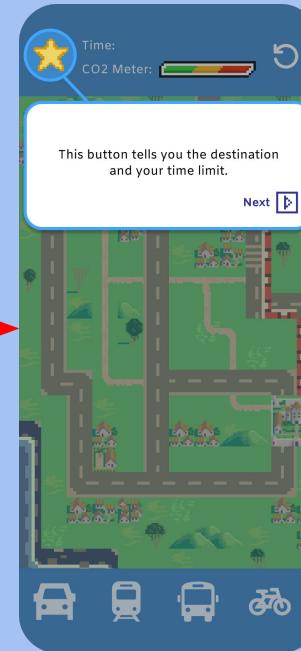
**Trolley**

- Very fuel efficient, 2 min per block
- Can only go to and from trolley station

**Car**

- Least fuel efficient, 0.75 min per block

**Play**





# Construct3 Iterations



Motion Events

Star Display Event

Star Event Test



Emission Events

Game Start Events

Level1 End Screen Events

Level1 Events

Level1 Tutorial Events

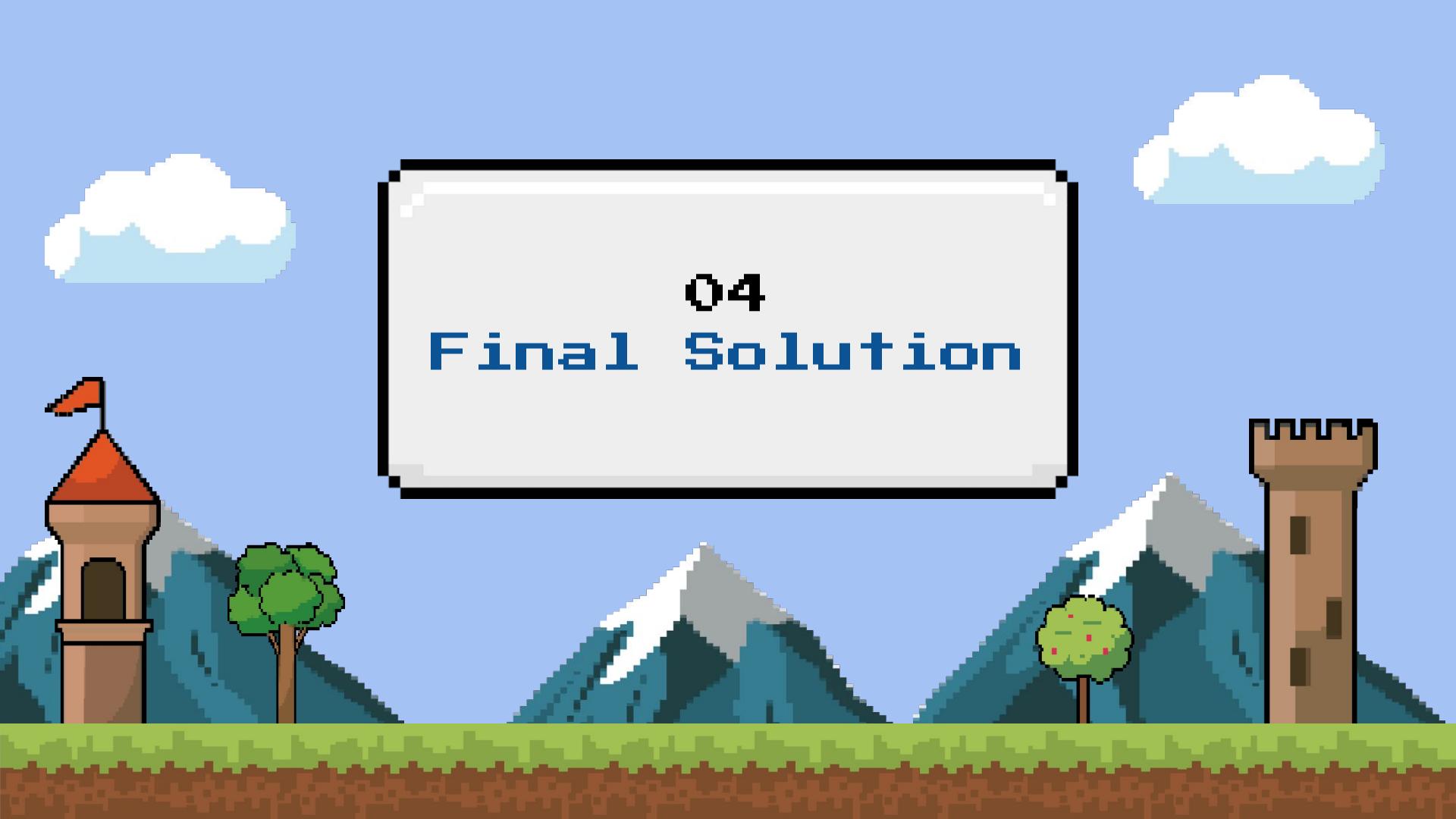
Motion Events

Star Display Event

Star Event Test

Timer Events





A pixel art landscape featuring a blue sky with white and light blue clouds. In the foreground, there's a green grassy field with brown dirt patches. On the left, a brown tower with an orange conical roof stands on a mountain peak. A single green tree with red flowers grows on another mountain. On the right, a tall brown castle tower with a crenelated top rises from behind a mountain. Between the towers, two more green trees with red flowers are visible. The background consists of several layers of blue and teal mountains.

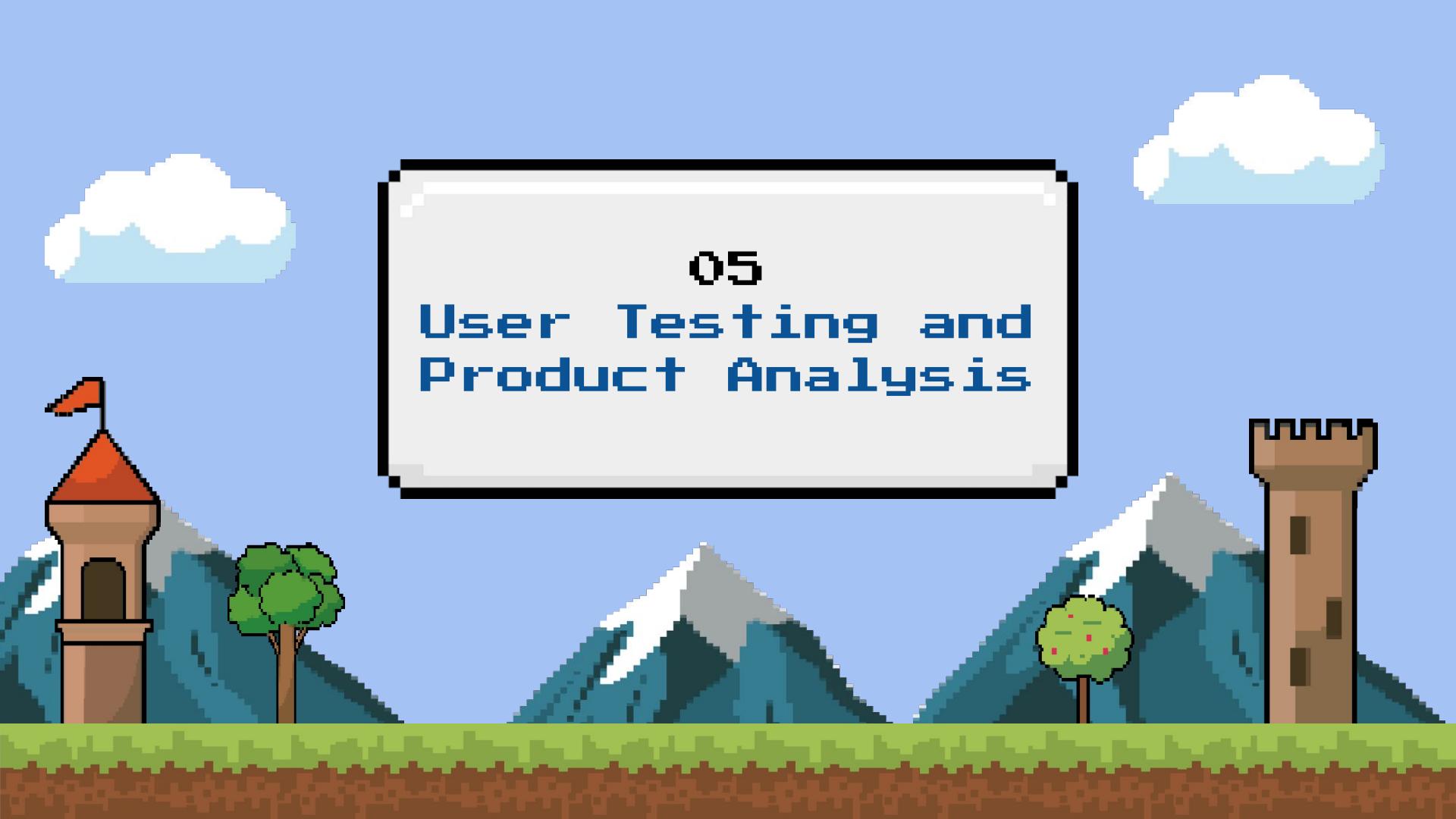
## 04 Final Solution

# Final Solution

**CREATE YOUR OWN GAMES**

Build and publish your own games just like Green Travel to this arcade with Construct 3!





A pixel art landscape featuring rolling green hills at the bottom, snow-capped mountains in the middle ground, and a blue sky with white and light blue clouds. On the left, there's a brown tower with an orange conical roof and a small green tree. On the right, there's another brown tower with a black conical roof and a small green tree with red flowers. A large, light gray rectangular box with a black border is centered in the sky, containing the text.

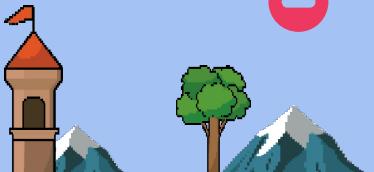
## 05

# User Testing and Product Analysis



# Survey Findings

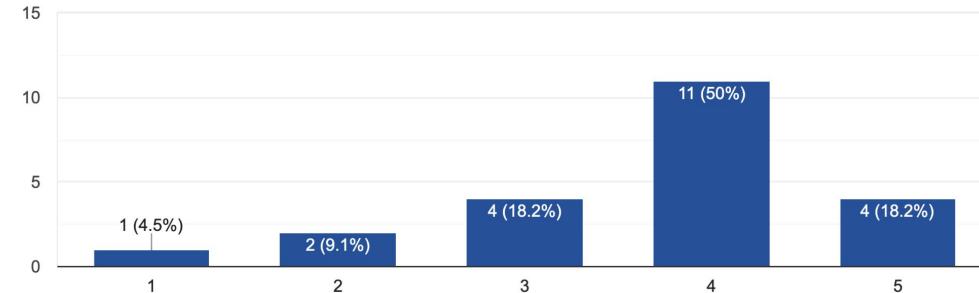
- ✓ Game is informative and alternative choices became more appealing
- ✓ Instructions are clear and easy to understand for most
- ✓ A majority of users indicated they would like to play again
- ✗ On mobile, difficulty moving the car or bike.
- ✗ Lack of levels and obstacles





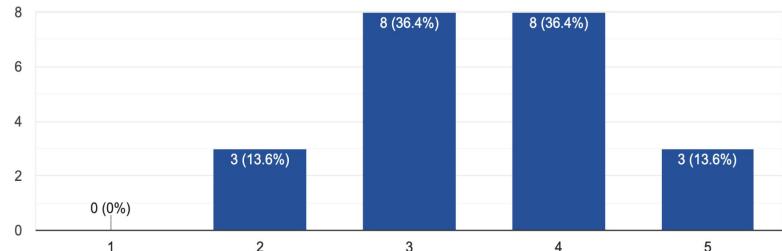
### How user-friendly do you find the commuting game on the PlanetFlip prototype?

22 responses



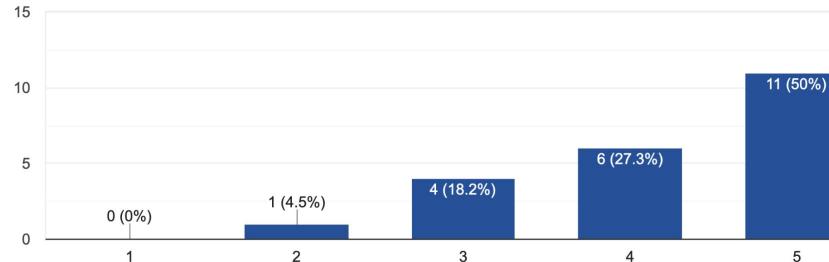
### How would you rate your desire to play this game again?

22 responses



### How would you rate your desire to play further levels of increasing difficulty?

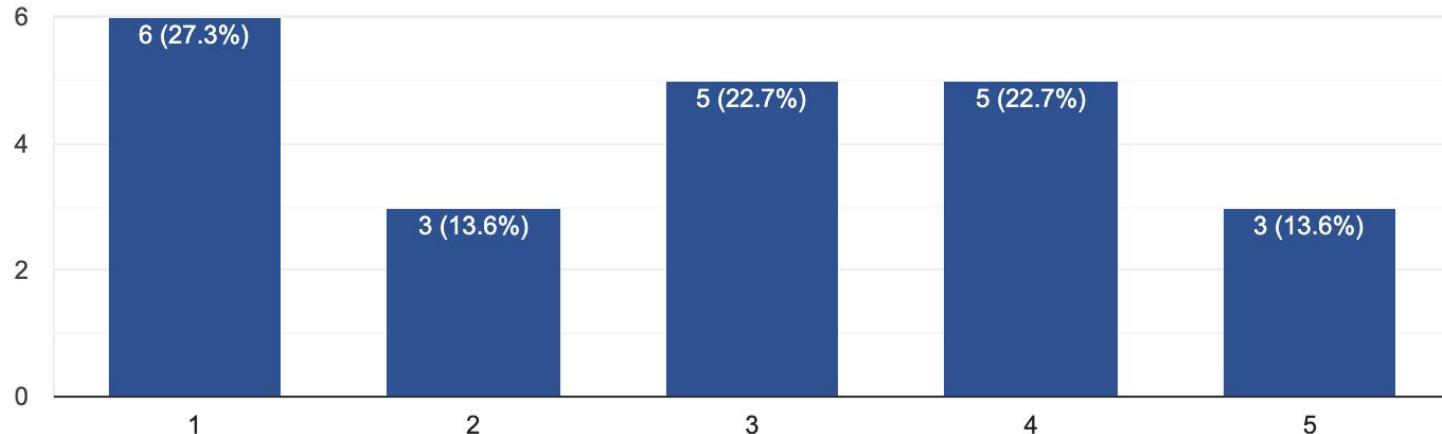
22 responses

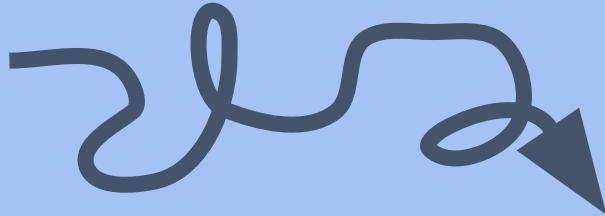


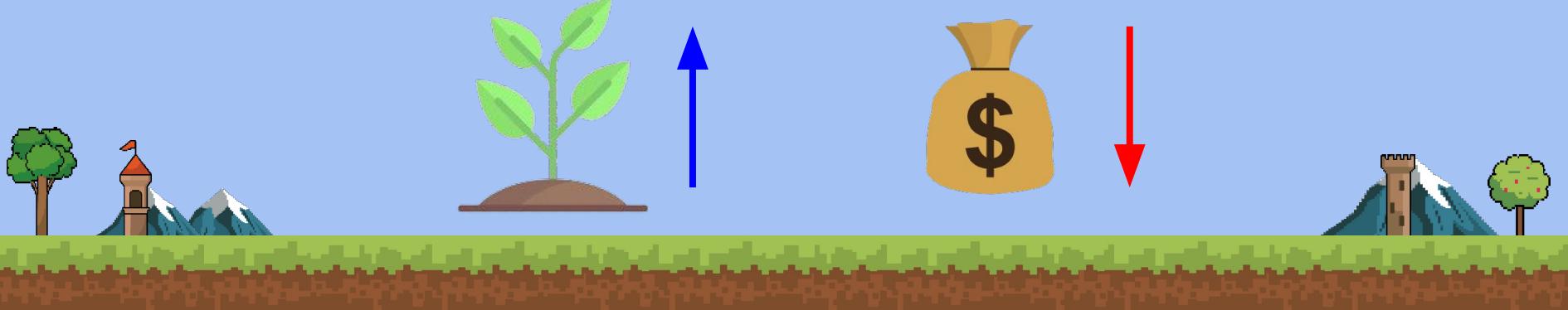
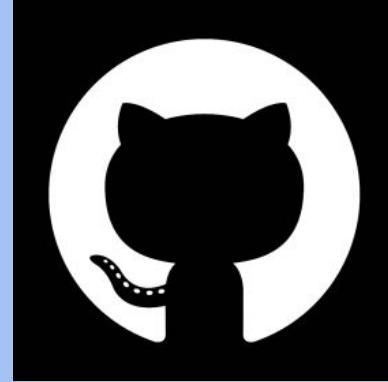
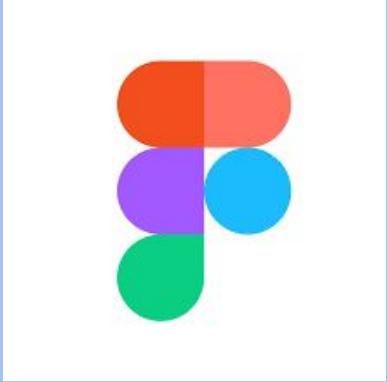
How likely are you to make alternative travel choices after getting to play the game?

 Copy

22 responses









A pixel art landscape featuring a blue sky with white and light blue clouds. In the foreground, there's a green grassy field with brown dirt patches. On the left, a brown tower with an orange conical roof stands on a mountain peak. In the center, a large, dark blue mountain peak is visible. On the right, another brown tower with a black conical roof stands on a mountain peak. Two green trees with red flowers are scattered in the landscape. A large, light gray rectangular box with a black border is centered in the sky, containing the text.

## 06 Next Steps



## User Suggestions/Wants



I can't continuously drag, I would have to click and drag multiple times and it would just automatically make me let go.

When moving the car out of the road, the car goes straight to the top left.

Dragging the car on my phone 😭

On mobile it was difficult to move the vehicles onto the paths

Cant play on phone. very hard

Seemed weird on phone

The icons for the car/bike sometimes wont move with where i place my finger/cursor.

Yes. When I clicked the car to place on the map, it automatically spawned next to the star. I was able to finish the game using a different route.

Users expressed frustration about the drag-and-drop functionality





Instructions are not very clear, a tutorial where it shows you how the game works would be nice

Once you start the game there is no way to view the goal of the level again. I forgot how many minutes I was trying to get, and there was no way to see that rubric again.

Include instructions on how to actually move around the map as well.



Users expressed confusion about mechanics

more levels, more competition

Maybe having the bus or the trolley on the first level

Would love different levels!!

Maybe consider adding a time, because buses have specific times to pick you up and a duration.

Or a currency if considering a rideshare (like Lyft or Uber).

or how traffic is affecting some roads.

More features were requested



## Future Goals

01.

### More Levels

Increasing difficulty

- Trolley and bus lines
- Park and rides, rideshares
- Currency use
- Scrollable map

02.

### Quality of Life

- Music / effects
- Bug fixes
- File Cleanup

03.

### Outside Interaction

- Leaderboards
- Spin or Pronto credits



## Looking Ahead



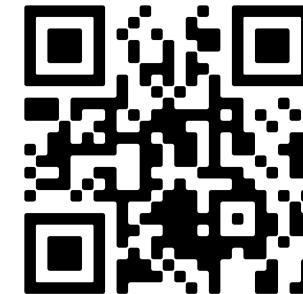


Thank you!



A pixel art landscape featuring a blue sky with white clouds, a green grassy foreground, and a range of blue and teal mountains in the background. On the left, there's a brown castle tower with an orange roof and a small green tree nearby. On the right, there's another brown castle tower. A large, light gray rectangular banner hangs from the top center, containing the text "07 Q&A". To the right of the banner is a white square containing a black QR code. Below the QR code is a black speech bubble with a white smartphone icon and the text "SCAN ME".

07  
Q&A



SCAN ME

## Green Travel



### Final Design Report

March 19, 2024

Group A

By: Aedan Bailey, Hana Ton-Nu, Mialyssa Gomez, Sebastian Arellano,  
Lucas Xu, Hogan Guo, Adrian Zhu Chou, Sujit Tunuguntla

**PlanetFlip®**

PlanetFlip  
Ron Kagan, Lead Project Manager      Green New Deal  
Emma Rodriguez, Campaign Coordinator



ENG 100D - Sustainable Development Design - Winter 2024

Professor Anh-Thu Ngo  
University of California, San Diego



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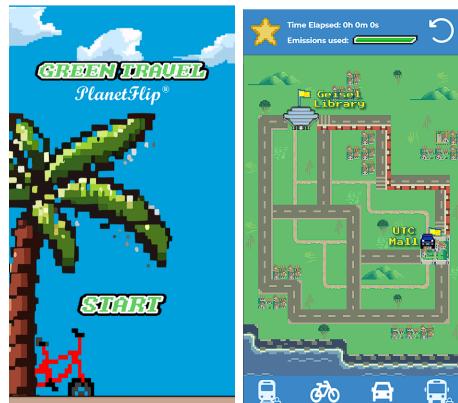
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## Executive Summary

For this project we were working with the organizations Green New Deal (GND) and PlanetFlip. PlanetFlip is seeking to create a community of environmentally conscious individuals on a platform to learn and share their experiences revolving around games, community events, and activities. The GND is focused on climate action and change within the UCSD community including decarbonization and educating about climate issues. Both groups are seeking further engagement on PlanetFlip through the gamification of climate education with the hope of bringing in and retaining new members. These fun and interactive games will be a draw for both communities overall and will provide lessons in climate action such as recycling and commuting.

We began with a design from a previous team involving a commuting grid game involving getting a player icon from a start to an end in various ways. Both Ron, with PlanetFlip, and Emma, with GND, had suggestions based on the previous team's designs that we sought to implement on PlanetFlip's preferred platform: Construct3. Using the previous design as a basis we sought to create a cohesive artistic aesthetic and begin to implement the needed game logic needed to play the game. We sought to implement a beginning screen and three levels.

We were able to provide a beginning screen and one level as proof of concept implementing all of the previous team's design and a few of Ron and Emma's initial suggestions. We created our designs in Figma and translated them into Construct3 with the addition of the game logic needed to operate the level. After creating our prototype we sent it out to mostly positive reviews. There are multiple bugs and some slight game design issues, but overall users said they wanted more of the game in more difficult versions.



## **1. Project Management**

### **1.1 Goals & Objectives**

#### **Broad Social/Environmental Outcomes**

1. Educate users about fuel consumption and transportation choices
2. Unify a community in support of climate action and making good choices to help the environment
3. Encourage people to use more sustainable transportation systems and adopt sustainable practices

#### **UN SDG Global Indicators 2023**

##### **1. Goal 11. Make cities and human settlements inclusive, safe, resilient, and sustainable**

11.2 By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities, and older persons

##### **2. Goal 12. Ensure sustainable consumption and production patterns**

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

12.8.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment

##### **3. Goal 13. Take urgent action to combat climate change and its impacts**

13.3 Improve education, awareness-raising, and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning

13.3.1 Extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment

## **Objectives**

We want to address the question, how might we gamify commuting so that users are more aware of their transportation choices and corresponding environmental impacts? Use the previous team's game design layout on Figma to develop a game on Construct3 by the end of week 9. We will look to incorporate and go based on the focus of commuting and the effectiveness of more environmentally friendly transportation methods. By gamifying an everyday action such as commuting, it encourages people to become aware of the effectiveness of climate action in a fun and easy way. In turn, this helps people feel more connected and directly responsible for the emissions in the environment.

In order to address the climate crisis and environmental injustice, the importance of our game is to help create a platform where people can learn the impact of positive action towards reversing climate change. Demonstrating the effects of more environmentally friendly commuting options through this game will present users with a way to assist with climate action in their everyday lives. Incorporating alternative forms of transportation that are more efficient provides the users with options to choose from that provide them with the necessary metrics to make an informed decision. Our group members have extensive experience pertaining to coding in several languages, which will be helpful during the application using the Construct3 license given to us, so we can exhibit a creative and successfully designed app pertaining to climate actions that can be taken during commuting.

## **SMART Goals for Developing Construct 3 Game**

- 1) **Launch a GitHub account to track progress:** Set up a GitHub Repository for the Coding team to be able to save and share document changes for the Construct 3 game files. The team repository will be used to keep track of each member's work and ensure that the pace of game development is met.
- 2) **Utilize Gantt Chart:** Implementing a Gantt chart allows us to schedule the progress and have timely completion of the project by having weekly objectives to delegate tasks and keep the team on track to finish by the end of week 10.
- 3) **Design Prototype App:** Create a playable and executable prototype of Construct 3 by trying to use the software through tutorials and given project files. The design team sketches in Figma and previous quarter designs will be imported into the layout of the Construct 3 game with each event page being updated accordingly.

- 4) **Finalize Prototype with User Research:** Iterating with group members we plan to update our layout execution by testing the app and surveying other users to get feedback on the overall performance of the apps to make edits before the final submission in week 10.

## 1.2 Approach

Our challenge is unique in the sense that we have already received a design from another group. A previous iteration of the class has achieved a design for the task at hand and it is our job to provide a working version. The previous group working with PlanetFlip has handed us a concept complete with icons, game mechanics, and initial level design; we seek to improve on that design by expanding to incorporate scaling levels, further game mechanics, and improvements on the original design feedback from our partners. We will use Figma to make our initial level designs and game ideas, incorporating the wireframe mechanics to flesh out our designs, objects, and the feel of the game. The game will then be implemented in our partner's preferred program – Construct3. Construct3 is a codeless game engine in which we can implement our design to be portable to the mobile platform PlanetFlip envisions.

Organization will take two forms within the project space. Relevant written work such as project reports and meeting notes will be stored in a shared Google Drive space accessible by all members. Our code will be maintained on the version control site Github, which will cleanly store all versions of our implementation and allow multiple members to contribute in separate coding environments. A Gantt chart will be used to organize our schedule and weekly meetings will be used to outline weekly objectives as a group and then break into smaller subgroups to complete tasks. Two main groups will be formed during implementation, one to design different levels and mechanics, and one to code and implement the designs provided. Both teams will meet with our contacts for the project, Ron Kagen and Emma Rodriguez, to both interview and obtain a solid understanding of the goals the project needs to accomplish and also for experienced help with the use of Construct3. Questions and continual updates to our parent org will be provided from our contact point, Hana to ensure complete communication is provided.

Our main approach is to center around a Human-Centered app that is fun to play and easy to use. We will test the game with outside individuals who can provide feedback on the flow and the messages that they retain. We will focus on important ideas about what influences green commuting obtained from interviewing our partners,

the previous design team, and different types of commuters. After the design and implementation period, the final version will be delivered to PlanetFlip for their use.

### 1.3 Schedule

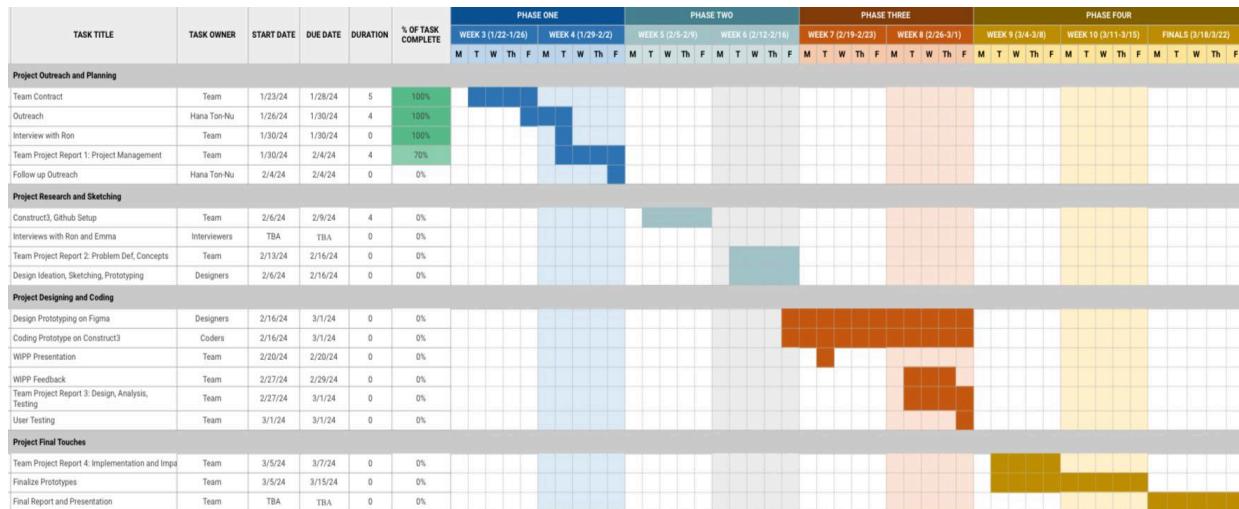
Our first major phase is about project outreach and planning. Our group was tasked with taking over a project from another group, which was the gamification of climate-conscious commuting. We then reached out to Ron Kagan, the creator of ProjectFlip, to learn more about what he wants to accomplish from within the game. He spent the first meeting going over some of the basic elements of Construct3, but our meeting was cut short. Pending a follow-up meeting, we took the opportunity to flesh out each member's roles. We created a group contract that went over the rules and expectations for the group. We agreed to be present for weekly meetings and offer feedback to other team members. In addition, we have been documenting all of our meeting activities and agreeing on action items that aid in streamlining our project schedule. This is the first step in our Design Report.

Our second phase is about research and sketching. Our initial meeting with Ron was a bit unclear so we want to follow up to learn more about ProjectFlip and its objective. We then want to learn how to use the non-coding-based program, [Construct3](#) and set up a GitHub page to allow our coding team to share a collaborative workspace. Our research and design team will begin by researching Construct3's community, engagement, and limitations to help us better manage our project. In preparation for the coding phase, we want to figure out game mechanics and answer some of the [questions](#) Ron had concerning the mechanics of the first prototype. We will then update the Design Report with a section defining problems and presenting concepts.

The next phase begins with the designing and coding phase. The design team will focus on prototyping around 5 levels, of increasing difficulty, for the game on [Figma](#). The coding team will then work to implement the game mechanics into the first two levels in preparation for the WIPP presentation. During the presentation, we plan on allowing our audience to play-test the first 2 levels of the game. We will then gauge community feedback to determine any adjustments that may need to be made. We will then update the Design Report with a section detailing our design elements, user experience and feedback, and an analysis of the results.

The last phase will be our finalization phase. We will aim to finish designing all the playable levels as well as any coding that may need to be finalized. We will publish Green Travel as a playable flash game on Construct3, and figure out how to best have

players explore PlanetFlip and its mission. We will then finish our Design Report by detailing how we implemented our project and how we impacted our player base. In closing, we will present our project as a playable version to our peers to showcase our team's efforts.



**Figure 1: Gantt Chart**

## [Link to ProjectFlip: Gantt Chart](#)

## 1.4 Team Bios



Aedan Bailey - Project Manager and Coder

Computer Science, 2024

[apbailey@ucsd.edu](mailto:apbailey@ucsd.edu)

**Relevant qualifications:** Previous Supervisor and Project management roles, coding (C++, Java, Python)



**Hana Ton-Nu - Community Liaison and Designer**

Cognitive Science Spec. Design and Interaction, 2025

[htonnu@ucsd.edu](mailto:htonnu@ucsd.edu)

**Relevant qualifications:** Experience with user testing, prototyping, Figma, coding (Python, HTML, CSS, JavaScript, Java).

**Mialyssa Gomez - Coder and Interviewer**

*Computer Engineering, 2025*

[mig012@ucsd.edu](mailto:mig012@ucsd.edu)

**Relevant qualifications:** Experience with coding (Java, C, C++, Python), Project team experience

**Sebastian Arellano - Designer and Documentor**

*Psychology w/ specialization in Cognitive Science, 2024*

[sarellan@ucsd.edu](mailto:sarellan@ucsd.edu)

**Relevant qualifications:** Experience with coding (Python), visual art design, play testing, psychological research

**Lucas Xu - Coder**

*Computer Science, 2024*

[k8xu@ucsd.edu](mailto:k8xu@ucsd.edu)

**Relevant qualifications:** Experience with coding (Python, HTML, CSS, Java, Javascript, C, C+, ARM), GitHub.

**Adrian Zhu Chou - Designer and Stakeholder Analysis**

*Cognitive Science with Spec. Design and Interaction, 2024*

[azhuchou@ucsd.edu](mailto:azhuchou@ucsd.edu)

**Relevant qualifications:** Experience with coding (Python, HTML, CSS, JavaScript, Java), Figma and GitHub.

**Sujit Tunuguntla - Coder**

*Bioengineering, 2024*

[stunuguntla@ucsd.edu](mailto:stunuguntla@ucsd.edu)

**Relevant qualifications:** Experience with Python, Java, C#, Matlab, and GitHub

**Hogan Guo - Designer**

*Cognitive Science with Spec. Design and Interaction, 2024*

[yug006@ucsd.edu](mailto:yug006@ucsd.edu)

**Relevant qualifications:** Experience with user research, prototyping, Figma, coding (HTML, CSS, JavaScript), and GitHub

## **1.5 Stakeholder Analysis**

### **Ron Kagan & Emma Rodriguez - High Power, High Interest**

Ron and Emma are our main contacts and directors for our project “PlanetFlip for UCSD Green New Deal”. They have put in great effort to launch this project so we will keep in close contact with them and share progress updates to ensure our solution meets their expectations. Besides, Ron will also be an important resource during our development stage since he has great experience in Construct 3, which is the software that we use to develop the game.

### **Anh-Thu Ngo, Ph.D. - High Power, Medium-high Interest**

Professor Ngo teaches important concepts that relate to sustainable design. The design techniques she taught about human-centered design would be used throughout the development of our project. She is the advisor for consulting our design and will be the one evaluating the final product at the end of the quarter.

### **US Government/Legislatures for Climate Action - High Power, Low Interest**

The government controls the laws and regulations that could make adjustments or changes to the climate standards, like the emission level. However, since the entities monitor the environment and potential threats in the big picture, they have low interest in individual or small businesses. What we need to do is keep track of recent climate regulations and make updates in the app to avoid any risks.

### **Consumers/Players - High Power, Low-Medium Interest**

The consumers and players of the app are the main audience. We want to keep these people interested in our app as the app was made for them. We can keep their interest by updating the app through additions like new levels, modes of transportation, information, interactions, etc. We want to keep them interested so that they can learn and share the app with other people.

### **Other Groups Developing the App - Medium Power, Medium Interest**

The other groups that are developing the app are crucial to this project. We have to keep each other informed in order to avoid developing issues. This could include overlaps in coding, making the app not function well, or misinformation creating confusion on what the app displays. It's important to share information and progress with other groups to maintain a smooth working environment and working app.

### **Climate Groups - Medium Power, Medium-High Interest**

Climate groups are the communities that focus on addressing climate issues. It's important to get in contact with these groups in order to help us develop the app. They would know most of what is happening with the climate and that could help us with the information that we use in the app. They could also be the first to test out the app once it's fully developed. This way we can get feedback and change what they deem as necessary.

### **Construct 3 - Low Power, Low Interest**

Construct 3 is the program that will be used to create the app. There is work already done for the app, we will transform that work and convert it to a system that is compatible with Construct 3. Learning to use this software is crucial as it's what will allow us to finish our product and maintain it over its lifetime.

## **2. Problem Definition**

### **2.1 Problem Statement**

As the impact of carbon emissions becomes more severe, it is crucial to increase people's consciousness toward these negative environmental changes and motivate them to act to mitigate the current situation, like reducing their carbon footprints. The UCSD Green New Deal organization needs to implement a playable game into the PlanetFlip app that is entertaining and educational in order to encourage users to be climate-conscious through their commute route. Traditionally, many environment-related concerns or actions are often delivered through media, talks, or campaigns, which were hard to get attention from some group of people, like teens, or young adults. These approaches are intended to make younger generations more aware of environmental issues and potentially negative impacts that they would do to worsen the situation.

### **2.2 Background & Context**

The challenge we are taking on is the implementation of a game created by a previous team. The previous team collaborated with PlanetFlip founder, Ron Kagan, to develop a game within the PlanetFlip app. The initial draft of the game lacked playability and visual elements that we are working towards refining and implementing into Construct3 so that it becomes playable on the PlanetFlip app. An overarching

challenge this game is hoping to address is educating the public about using public transportation to curtail the harmful emissions generated by inefficient commutes and gas-powered vehicles.

The impact stems from the burning of fossil fuels used in transport vehicles by humans. The environment is negatively impacted by the man-made release of toxic carbon emissions, as this leads to global warming and ultimately undesirable climate change. The people affected can be anyone who experiences the effects of climate change. These effects can range from health issues because of the polluted air quality to increased global temperatures because of excess greenhouse gasses. For our purposes, our end users are residents of the La Jolla area who have the opportunity to take advantage of an available multi-modal system of transport. Residents sometimes lack awareness of the importance of using public transportation, as well as the accessibility and ease of use. Alternative transportation can sometimes be more convenient, efficient, and cheaper than using a car. Our stakeholders will also be impacted by the challenge in that they will use the game for their organization members to further reach their goals in taking action toward climate justice.

Green New Deal (GND) at UCSD is a grassroots collective of UCSD affiliates that focuses on campaigning the UC system to take action towards climate justice and climate change. They have 5 main goals, such as: ensuring justice and degrowth are taught in the Gen Ed climate requirement, implementing the Chancellor's goal to electrify by 2030, cutting ties with fossil finance and ending industry-funded research, advocating for non-profit public ownership of the city's electric distribution, support student well-being and workers' rights (unions). They also want to ensure people know what climate action is and how they can take steps towards it.

Ron Kagan developed PlanetFlip in response to support GND goals in order to attract member participation and foster public education on climate decisions. PlanetFlip is an application in beta testing that aims to provide a platform for games centered around learning about climate change and fostering member engagement. He is developing games through Construct3, an online game engine, and has provided us with guidance in providing a starting code for last year's game prototype, "Green Travel" and teaching us how to use Construct3. He is also providing feedback and insight on the design of the game to be more functional and effective in attracting users. According to GND representative Emma Rodriguez, GND hopes this game can be used by other student organizations and people outside of GND for climate change

purposes. She wants to boost community engagement and focus on member retention through the gamification of learning.

The Green New Deal's challenge was to teach the public about how they can participate in fighting for climate justice and making climate-conscious decisions, as well as improving member retention and participation in climate activities. PlanetFlip was created to help reach these goals through gamification. Last quarter, a group began the process of designing a game for PlanetFlip to add to their game selection. They created a prototype of "Green Travel", based on user's commutes and how they can make use of multimodal travel to reduce their fuel emission. This quarter, we hope to build off their prototype and create a working beta on Construct3.

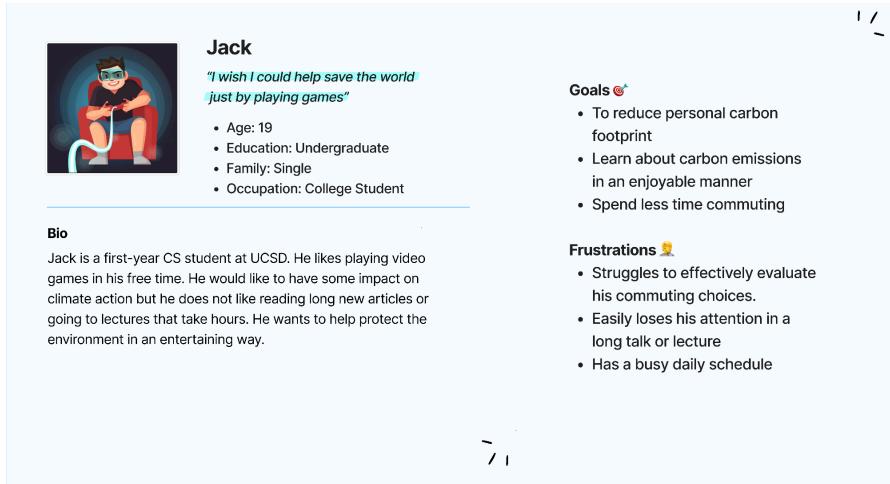
In the future, we would like to see groups expand the map so that it covers more than the La Jolla area. Due to our limited time, we are only able to design a handful of levels, we would hope future teams can increase the number of playable levels. This can mean expanding the selection of themes, transit options, or rewards. For example, the map themes can be based on different areas of California or there can be customizable car/trolley options. Our version of Green Travel includes a leaderboard to create some competition, but Ron was keen on the idea of having the game be multiplayer. We also fancied the idea of working with existing campus resources to enrich the experience for the user, which includes UCSD faculty, students, alumni, etc. One of our ideas for working with other campus resources includes SPIN credits as a reward for obtaining a certain amount of daily logins or levels completed.

The Green New Deal identified that their members feel like there is a lack of appealing activities. The past iteration of the game is in an unplayable state and was very simple in terms of its visual design, which lacked visual familiarity, especially of La Jolla where our users are based. This can make it difficult for users to translate their experience within the game onto their real commute. The game layout can be confusing because of the clutter of words and metrics. The visual design is also outdated and simple which makes it not as attractive in its game experience and replayability. For the bigger picture of the problem of climate change, users lack the necessary education to be climate conscious in their lifestyle and understand how they can participate in climate justice.

We were able to communicate with the representatives of PlanetFlip and the Green New Deal. Open communication with Ron Kagan and Emma Rodriguez allowed us to learn about the organizations we are working with. In turn, we are able to focus our efforts on designing a product that is suitable to their goals and addresses their

needs. We were also granted four licenses to Construct3, a game-making software that requires little to no code. This tool allows us to seamlessly transition our visual design of the game into a playable version of the game. Additionally, we were thinking about an incentive system that would reward players for their activity on the PlanetFlip app. Potentially working with the Triton Commuter Club, which helps users plan alternative routes to their commute, find carpool partners, and offers incentive drawings for logging trips on RideAmigos.

## 2.3 User Profile



**Jack**

*"I wish I could help save the world just by playing games"*

- Age: 19
- Education: Undergraduate
- Family: Single
- Occupation: College Student

**Bio**

Jack is a first-year CS student at UCSD. He likes playing video games in his free time. He would like to have some impact on climate action but he does not like reading long new articles or going to lectures that take hours. He wants to help protect the environment in an entertaining way.

**Goals 🌎**

- To reduce personal carbon footprint
- Learn about carbon emissions in an enjoyable manner
- Spend less time commuting

**Frustrations 😞**

- Struggles to effectively evaluate his commuting choices.
- Easily loses his attention in a long talk or lecture
- Has a busy daily schedule

Figure 2.1: User Persona

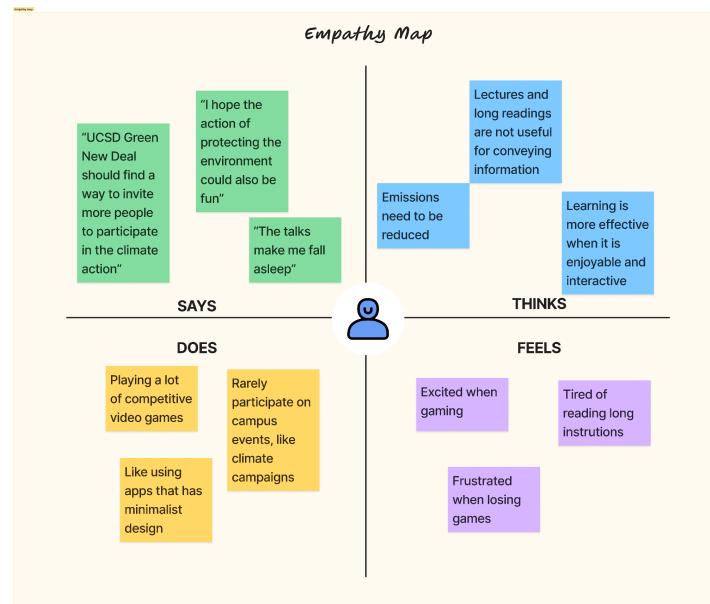
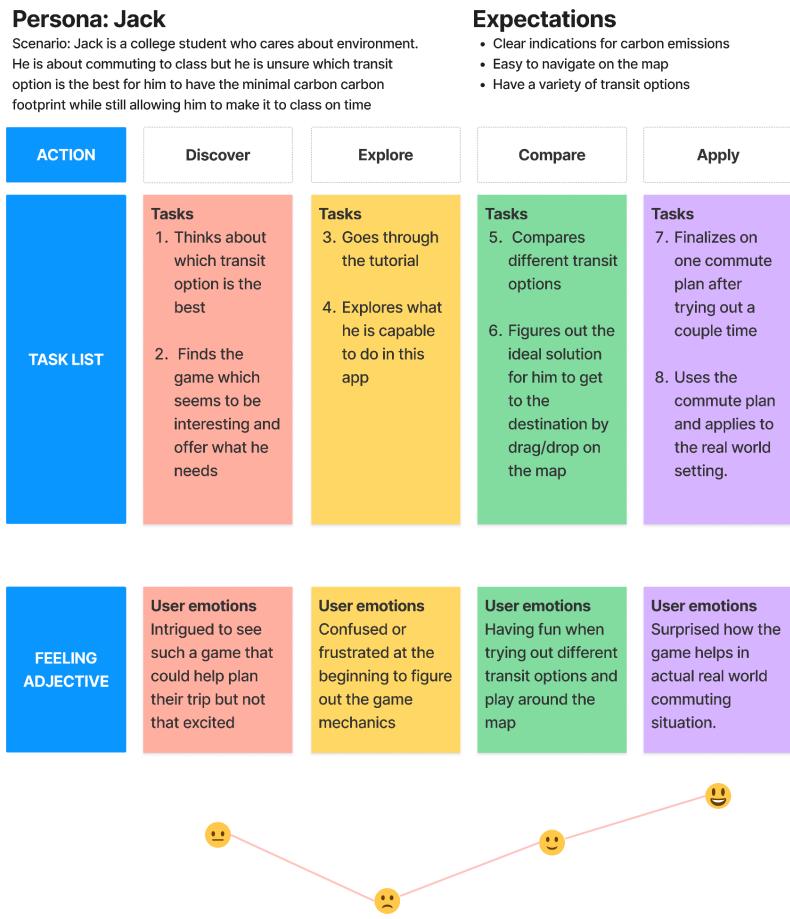


Figure 2.2: Empathy map



**Figure 2.3: User Journey Map**

## 2.4 Design Requirements

Criterion	Requirement
Usability	The game should be easily understandable with an intuitive playstyle to allow ease of use for players.
Producibility	The game should have an easy-to-understand implementation so that it can be further improved by future implementations.
Desirability	The game must have simple interactive graphics and content that ensure a user-friendly interface so that the user has an enjoyable experience playing the game.

Feedback	The game must provide responsive tactical, visual, and auditory cues to signify the current stage of the game because this creates a connection between the user and the game.
Suitability	The game should be representative of daily life and commutes to better reflect our users' lives in order to address the climate crisis.

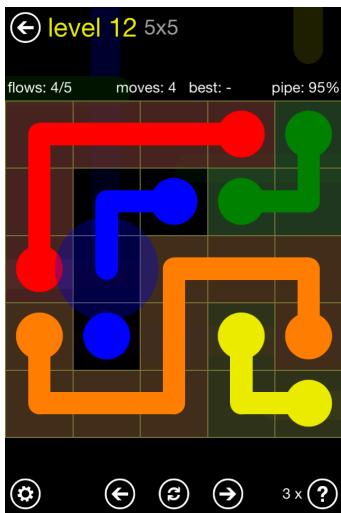
### 3. Concepts

#### 3.1 Existing Solutions Analysis

For our research, we mainly focused on getting inspiration from games that have simple, yet engaging designs for their intended purposes. This was to garner inspiration to produce an effective user interface (UI) for our game, in addition to getting appeal from engaging level designs. We focused our efforts on existing puzzle games to be the basis for our game's layout, coming across these examples:

 <p><b>Mini Metros &amp; Mini Motorways</b>  <b>Mini Metro</b>      build a better subway</p>	<p>Mini Metro and Mini Motorways give players the freedom to draw out lines to create roads for cars or plan the metro route by connecting points. Players could design subways or roads for cities like London or New York. One unique feature is that players can select different color palettes, including colorblind and night modes. However, the game does not include famous landmarks for each city, leading to a less immersive experience. One improvement that could be made is having maps using references from real-life locations to increase immersion.</p>
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### Flow Free (Mobile App)



Flow Free is a free mobile game that challenges players to complete puzzles by filling out the grid and connecting all the corresponding colors with lines using drag-and-drop functionality. It also features undo, reset, and hint buttons that give quality-of-life design sensibilities to the game. However, this game only provides differentiation via colors. We plan to improve this design by using a similar drag-and-drop system for their method of transportation on a grid-like puzzle-level design. Methods of transportation like trolleys and buses have checkpoints that must be followed, while other options like bicycles and car offer more freedom while still having realistic paths.

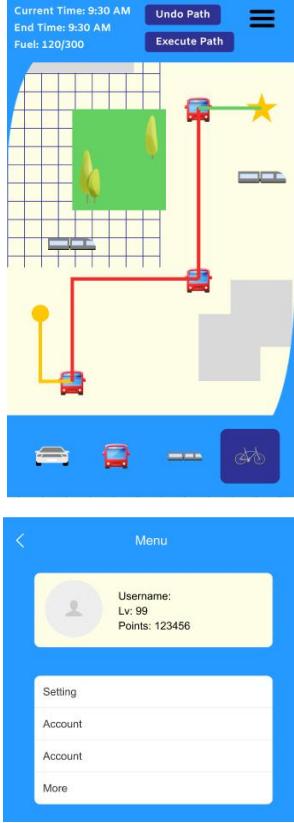
### RecycleIt

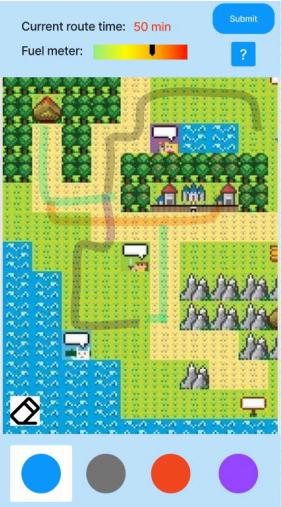
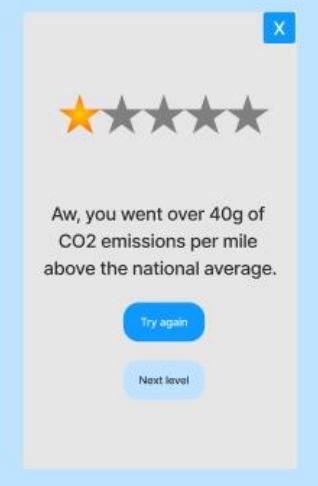


RecycleIt is a game featured on the PlanetFlip website that challenges users to separate different items of trash into their respective bins for disposal within a time limit. It encourages users to think about where to correctly dispose of different items, rewarding players with a higher score for each correct answer. Users can learn from this game, taking this knowledge into their daily lives. It also encourages friendly competition by saving players' high scores with the ability to share them with others. We would like to take inspiration from this game by having our game produce a similar message to address the climate crisis, extending the game's longevity. However, this game is very simple with plain colors and not a great UI design. Its instructions are minimal and not as intuitive.



## 3.2 Concept Generation

<p><b>Old Prototype + Hamburger Menu</b></p> 	<p><b>Identifier</b> — The map is grid-based and some modes of transportation have a set path, with metrics that include fuel limit, time constraint, undo path, and execute path button.</p> <p><b>Core Need</b> — The user interface is very simple and allows the player to pick up the game very easily (usability).</p> <p><b>Strengths</b> — Redesigned user interface, which includes a hamburger menu that allows users to access their accounts, leaderboard, settings, and more tabs.</p> <p><b>Weaknesses</b> — Visual design elements lack a resemblance to La Jolla and the playable area is limited which limits users ability to explore alternative commuting routes.</p>
<p><b>Realistic Visuals</b></p> 	<p><b>Identifier</b> — This concept takes a realistic approach to its visual design. This means a real-life map of San Diego with accurate geographical points. It also uses detailed icons for its transit icons to match real-life depictions.</p> <p><b>Core Need</b> — The most important need it solves is by matching the user's model so the game is easier to play. This is because the user is most likely to be familiar with a map of their local area and the routes it has, allowing the user to play the game easily.</p> <p><b>Strengths</b> — Accurate mental model, recognizable stops and locations, accurate transit lines that the user may know/use already</p>

	<p><b>Weaknesses</b> — Lacks a submit button, too complicated, visual clutter, hard to zoom in/out, no grid</p>
<p><b>Pixel Map Visuals + Fuel Meter</b></p> 	<p><b>Identifier</b> — This unique concept is useful in that it allows the user to be aware of other alternative methods of transport that compare the route time to the fuel usage to be able to make an important thoughtful decision of which tradeoff is better.</p> <p><b>Core Need</b> — By implementing this design, it mitigates a significant portion of CO2 emissions from the burning of fossil fuels by vehicles as the users will be more aware of the tradeoff between time of travel and fuel usage and be able to opt for the environmentally friendly option</p> <p><b>Strengths</b> — Effective in displaying the image with the estimated route time and fuel meter while also displaying the accurate possible route options.</p> <p><b>Weaknesses</b> — Visually, there are a large number of unique icons, making it hard to follow and the route colors are not easy to comprehend and match up.</p>
<p><b>Star System</b></p> 	<p><b>Identifier</b> — The usage from implementing a star system that shows the user how efficient their form of transportation from a 1 to 5 star scale is visually pleasing. It allows them to be interested in their rating received and enables them to be more likely to read the description at the bottom and sparks interest in trying again.</p> <p><b>Core Need</b> — Presents a rating that can be recorded for the user that can be analyzed with the previous results to predict future statistics and overall average score based on usage of transportation form.</p>

	<p><b>Strengths</b> — User friendly in that it is easy to understand the scale for if the user is doing well or poor in emission of CO2</p> <p><b>Weaknesses</b> — Graphics can be improved in the color layout along with the size &amp; style of font to make it more visually appealing with more white space.</p>
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### 3.3 Concept Evaluation & Selection

Our team's project is to build upon an existing design and adjust it to make a better game that lends more towards user engagement. In this regard, we decided to form our decision matrix based on three of our most important feature debates about what we wanted to include in our game. We decided on a pixelated setting of La Jolla, a Fuel Emissions Bar, and an Expansive map. These 3 items we felt weighed the most into usability and desirability for our users and their overall playing experience. Our interviews with Ron and Emma also emphasized player choice rather than limitation and a greater sense of user relatability to the game. We based our concept evaluation with the baseline being the previous groups' initial game design.

**Table 3.3: Weighted Decision Matrix**

Weighted Decision Matrix							
Criteria	Weight	Pixelated Setting	Realistic Setting	Fuel Limit	Emissions Bar	Expansive Map	Static Map
Usability	4	0	0	-	+	-	+
Producibility	2	+	-	0	0	-	+
Desirability	4	+	-	-	+	+	-
Feedback	1	0	0	+	+	0	0
Suitability	3	-	+	-	+	+	-
<b>Total</b>		1	1	-2	4	0	0
<b>Weighted Total</b>		6	3	-10	12	1	-1

## 4. Analysis & Testing

### 4.1 Overview

**Table 4: Analysis and Testing Summary**

Criterion	Metric	Target Value	Resultant Value	Method Evaluation
Usability	Intuitiveness	Ease of use and clarity of gameplay	Introductory page with instructions, game mechanics are intuitive and responsive	Testing
Producibility	Record Keeping	Well defined code repo and project description	Google Drive with design process documentation, GitHub with project files and changelog, and Construct3 files.	Analysis
Desirability	Visually Pleasing	A graphical interface that users enjoy looking at and playing in	A cartoonish pixel interface reminiscent of other grid-style games	Testing
Feedback	Responsiveness	Users should know their location on the map and game status	Sprite indicators of vehicle location and trail markers to show location, time, and emissions updates to show the current score	Testing
Suitability	Realistic	The map is accurate to the area of interest	Options resemble the La Jolla area, include accurate routes for different modes of transportation	Research

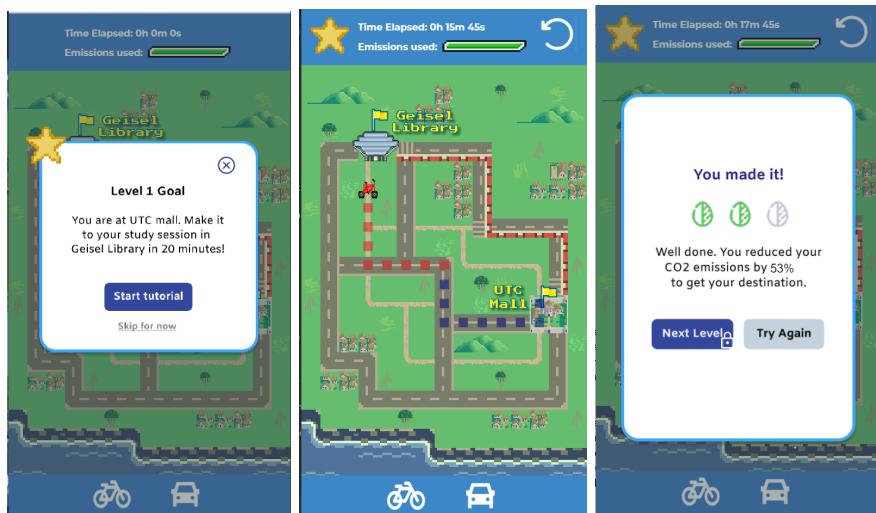
Our initial conversations around creating the game revolved around using the previous team's initial Figma designs and incorporating the notes that Ron and Emma had for us. We wanted to make sure that we were allowing the user to assess the options they had available for full knowledge of their use, as well as be able to relate to their own experiences. Initially, we designed out how the game should look and feel on Figma, and worked on replicating those Figma experiments within Construct3. The initial design was set in an empty background with no clear through line of

transportation, so we made sure to implement a more comprehensive system and options for travel. Additionally, we wanted a cohesive art style that could be used in additional levels and we used Pixel art tools to create this. Our focus has been on creating the art and a proof of concept level to be presented, providing a template for other groups to follow. Maintaining proper code documentation and design iterations was important for this handoff to occur so we have been diligently maintaining these methods.

## 4.2 Desirability & Usability

We decided to ask users about our game and wanted to figure out some things about our game. Enjoyability is a big aspect we wanted to learn more about, we also wanted to learn about any accessibility issues test users face, and finally we wanted to figure out the impact the game made on the user's thought process of carbon emissions.

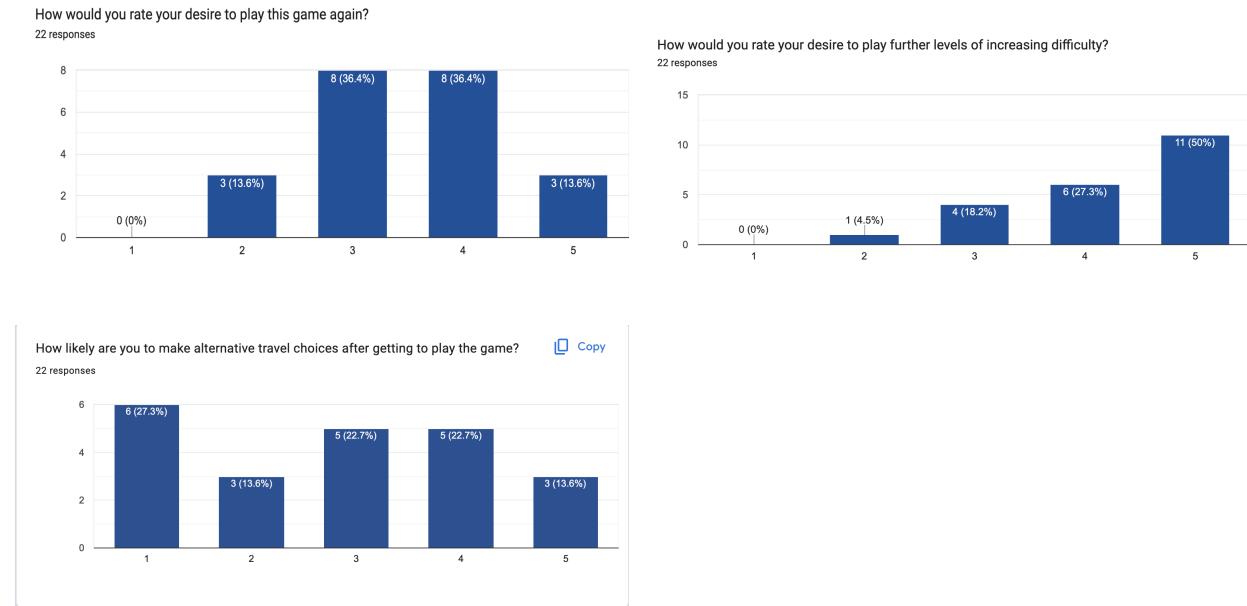
We interviewed 22 individuals primarily in college. We asked these users to play a level 1 we developed where a user has to navigate from UTC mall to Geisel library using a car or a bicycle. We implemented tutorial popups as well as goal and reset buttons to give ease of access. We had an emissions bar to indicate the score the user would get and a final scoring to show the user how they did.



**Figure 4.1: Finalized working prototype on Construct3**

The results we got showed that the users wanted to play further levels but did not have the desire to repeat the same 1-level game. Users indicated that they had a hard time playing the game due to the rough drag-and-drop mechanic. The results were mixed

showing some who would change their travel choices and some who would not after playing the game.



**Figure 4.2: Survey Findings**

The results we had were optimistic, showing that with further development of the game, users would be willing to play. Users indicated they would be happy to play further levels but needed some bugs to be fixed. Accessibility-wise, users mainly complained about our buggy drag-and-drop mechanic. Impact-wise, our solution does have a meaningful impact as in testing it was shown that 36% of individuals indicated they were likely to make alternative travel choices after playing the game.

We also asked users for suggestions to incorporate into the game, as well as any difficulties they had while playing. Users noted problems with the drag and drop through our testing interface, saying that it was hard to move the car and bike around. Users also described instances with the borders in which their sprite would shoot off and become unusable in its new and unintended position. Some suggestions we received included the use of electric cars and other transportation options, currency-based like rideshare, and regular walking.

Some new factors were also brought to light during testing. Some users reported that while they enjoyed the game and its message, they couldn't act on it because the only possible method of transportation near them was by car. Biking or taking the bus was unfeasible for these specific individuals. Others didn't quite understand the impact they were making as they reported our end screen was a bit

confusing. Without knowing what exactly they were working towards, they were less motivated to do so.

### 4.3 Feasibility & Suitability

Our project goal was to create a complete game by the end of the quarter. Unfortunately, due to many different constraints, we decided to aim for a beta version of the game instead. The main limitation of our original project goal was time. While all members tried to put as much time as they could into the project, every member had other classes and compromises that they had to attend to, limiting the time we could spend working on this particular project. Other limitations include Construct 3 costs and access codes, GitHub bugs, and coding bugs. Because Construct 3 is a paid service, we were only given 4 access codes for our team to use. This limited our team's ability to distribute the coding workflow effectively between our team members. We also decided to share our coding progress through GitHub. This platform is typically reliable and easy to use, but as we were using this service we experienced file corruptions and work being overwritten by members pushing at the same time. This would delay our coding progress as members would have to redo their work.

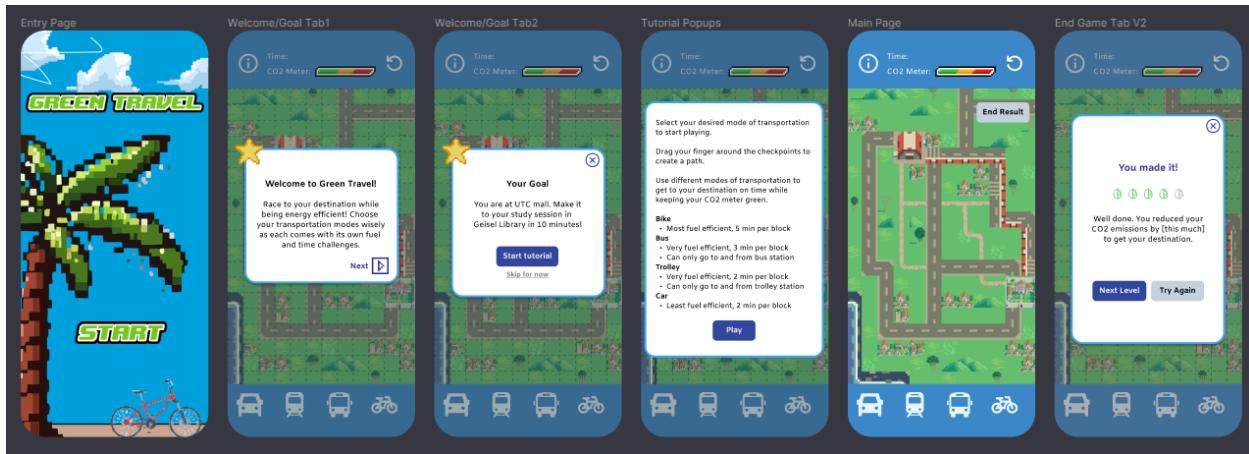


Figure 4.3: First Figma Prototype Screens

Our team believes that there are adequate resources to create and deliver a solution using platforms, including Figma and Construct3 that we can design and iterate from based on the provided information from PlanetFlip. Given our limited time this quarter to work on the app project as a team, we plan on being able to design a working layout for the app that incorporates several elements including forms of transportation, emission bar, path taken, and timer that can be transformed into a

working app. Although we do anticipate bugs given this process is a learning experience for our team, we plan to provide a working app design to Ron and PlanetFlip to get their feedback and possibly test it later with beta users. We have implemented the game based on the notes given to us by PlanetFlip and are building off of the work done in the past quarter by the previous group for the features that should be included in the app and how we can make it user-friendly. We anticipate the solution of the app to be executable, although it will not be ready for a complete launch on the app store as it will take several rounds of testing and iterating.

## **4.4 Sustainability**

### **Economic Sustainability**

Our solution is mostly affordable in terms of implementation and subsequent maintenance. For the design part, we use the Figma education plan which is free. For coding and implementation, we use Construct3, and its licenses are distributed by the project lead, Ron. All repositories are stored in GitHub. The game will be maintained and run on the PlanetFlip app, and all the data will be stored on its server, which means no additional cost for maintaining the game on an additional platform. The subsequent team or developers will have easy access to the entire library of our codes from GitHub, and the design prototypes/ UI components in our Figma file. For users, they only need to download the PlanetFlip app, which is free, from their mobile devices, and get access to the game. By playing the game, they would be able to have a clear knowledge of how to plan their trip to minimize their carbon footprints.

### **Sociocultural Sustainability**

Our solution is culturally appropriate because it addresses climate action by educating players on the effects of different types of commuting methods, a specific attribute towards climate change without overstepping any socio-cultural boundaries. Our game reflects the lives of computers, which applies to the majority of people in our community, especially in San Diego, our target audience. Our stakeholders, Ron and Emma, assisted in our design process as they are representatives of UCSD Green New Deal, the climate forward organization at UCSD that focuses on addressing climate action. Our job is to educate people on the effects of carbon emissions due to commuting, which can be directly harnessed and replicated by the user by taking what they learned from the game and applying their own to their daily lives. If they choose to replicate or improve on our solution, then the resources to do so are readily available with minimal cost. Since our solution is a game that focuses on educating players and

not directly climate action, it does not promote social justice directly and instead informs players on how they can use the many different transit methods available to do individual climate action.

## 5. Design

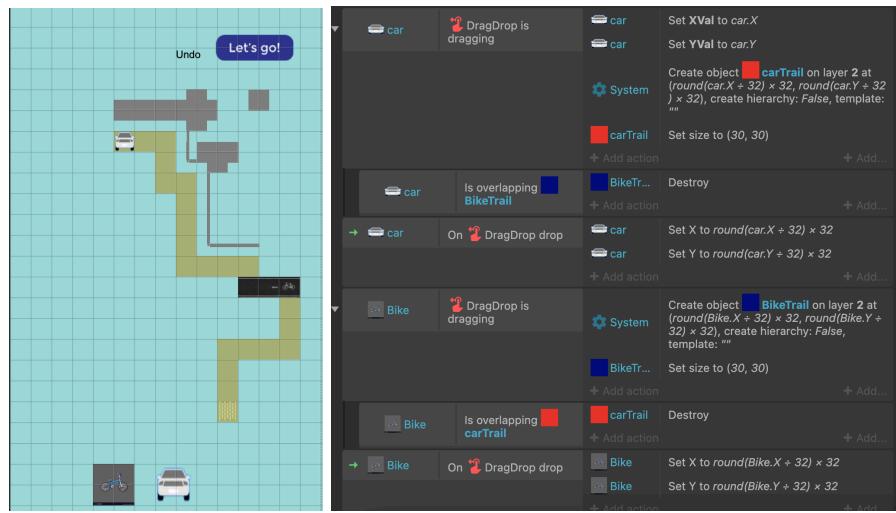
### 5.1 Overview

Green Travel is one of the many games that is going to be available to users on the PlanetFlip app. Green Travel's main objective is reducing emissions from inefficient commutes by encouraging players to use alternative and more eco-friendly modes of transportation. Players will be challenged to navigate to an objective by using the multi-modal system of transportation in La Jolla that includes the existing Bus, Trolley, Road, and Bike routes while focusing on minimizing emissions. Members of the Green New Deal at UCSD will be able to compete against each other to see who can have the best commute in terms of reducing emissions and time.

Using the feedback from Ron and taking inspiration from the work of the previous team we are looking to implement a map that mimics the La Jolla and San Diego region. Our design implements a user-friendly interface with graphics that are colorful and appealing to the user with the game being easy to follow. The familiar iconography of our design immerses players in our game and hopefully encourages users to form a deeper connection to La Jolla. The new aesthetic incorporates an environmentally focused layout with green as the primary color and elements of nature, such as palm trees, the beach, the coast, and clear skies. Each form of transportation impacts the emission bar and timer at different rates. One scenario in our game would be if the player decides to only use the bike to curtail all emissions. While marvelous, biking long distances may not be practical and can take a great deal of time and would exceed the allotted time. Another case would be if the user decided to only use the car. This would be the quickest way to commute but it produces an exorbitant amount of emissions, which would exceed the allotted amount of emissions. This would lead users to explore using several modes of transportation to both commute quickly and efficiently. After users have completed our game, they will be directed to additional resources like the Triton Commuter Club that would allow them to follow up on their journey of positive climate action while rewarding them for their climate-conscious commute.

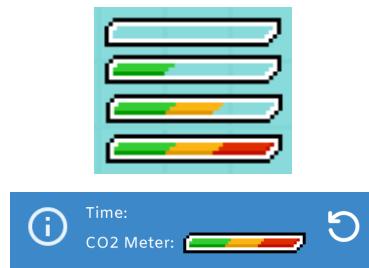
## 5.2 Detailed Design

Construct3 is a codeless software, and how it is set up is a system of ‘layouts’ and ‘event sheets’. The layout is where all of our objects are placed, this is where our travel sprites will appear as well as visual indications of where the user has been, the informational menu, and the sprite switchers. The event sheets are where all of our game logic is located; based on the events that occur in the layouts, conditions within the event sheets will be checked and the layouts will be updated accordingly. These include barriers, limitations, trail-making, and score tracking.



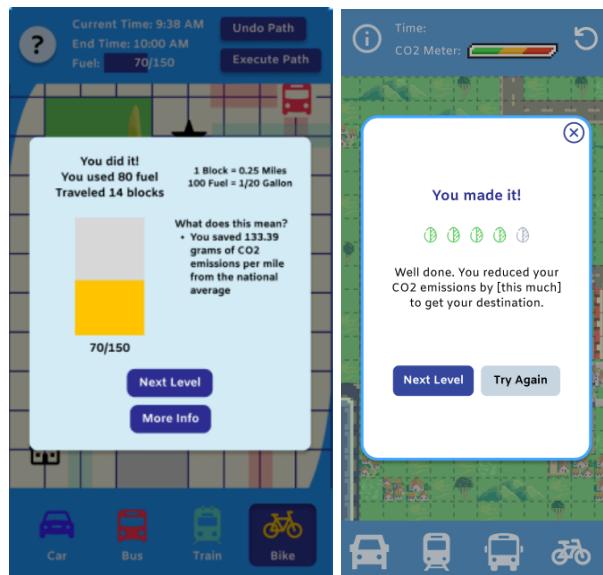
**Figure 5.1: Motion Layout and Motion Events**

The above defines the dragging behaviors for the car and the bike to set the coordinates to block the car/bike it overlaps and spawns a car/bike trail. It also defines behaviors so if a car overlaps a bike trial or vice versa it will destroy and replace that trail. It also will allow the object to be snapped to the nearest block on the grid when dropped.



**Figure 5.2: Emission Bar**

In our game, we utilize a “CO2 Meter” to track the emissions created from the player’s selected mode of transit. This serves as an additional constraint to time that shows how much CO2 is being emitted as a result of using the different transit methods. The display bar starts as empty and increases as the number of blocks the player has traveled increases, multiplied by the number of CO2 emissions created by that specific mode of transportation. If it is in the green section, it is below the San Diego average CO2 emissions, if it is in yellow, it is within range of the average CO2 emissions, and if it is in red, it is above average CO2 emissions. The artwork was made on a website called makepixelart.

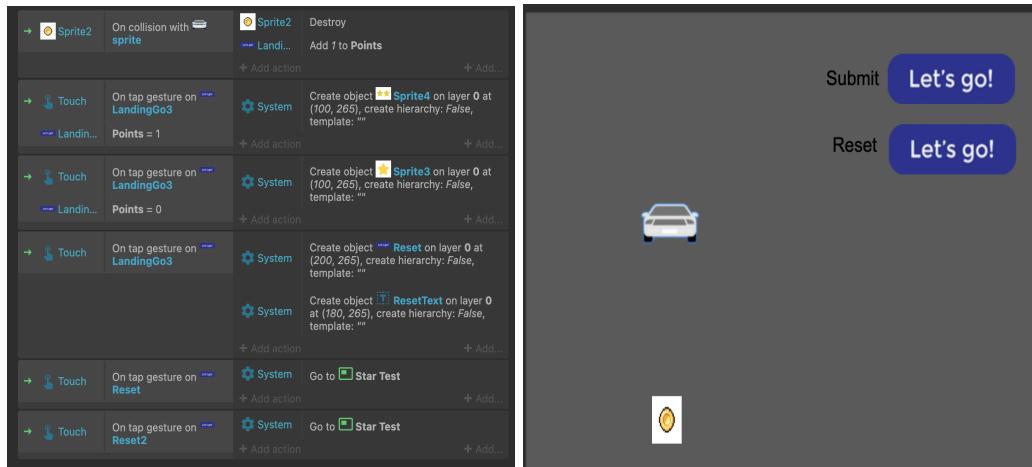


**Figure 5.3: End of Level Emission Evaluation**  
**Left: Previous team’s implementation, Right: Our team’s implementation**

Above represents the Figma prototype of the evaluation screen that is slated to show at the end of every level. On the left, we have the previous team’s design that shows the metrics of how the emissions are calculated and a bar that represents the carbon emissions that were saved under the constraint. In our version on the right, we chose to minimize the information to make it less cluttered and more straightforward with how the information should be taken. The previous team had done preliminary research for us regarding how to best convey the information on how the created emissions affect the environment. We are utilizing the same research and building on top of their findings to be applied to the different transportation methods.

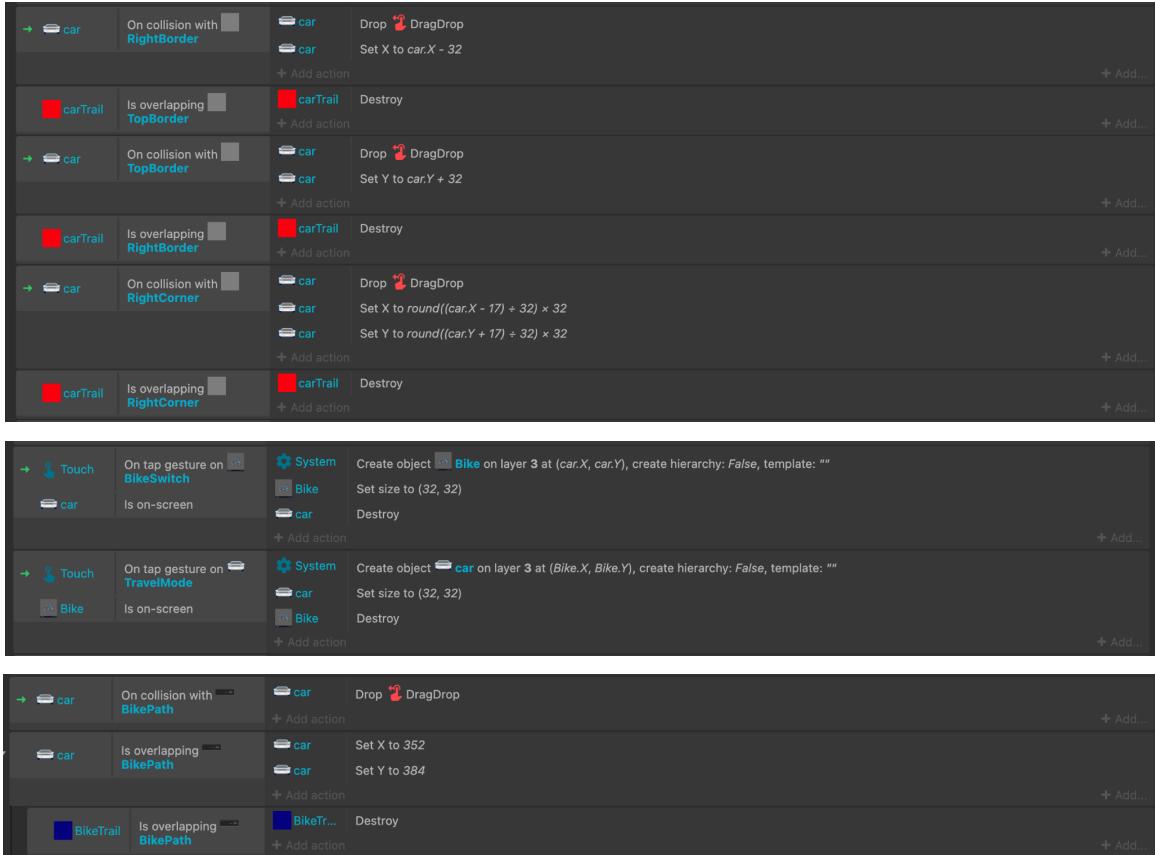
From the previous team’s report, they have found the exact carbon emissions from “...the San Diego Metropolitan Transit System (MTS) and the US Environmental

Protection Agency (EPA), we scaled the amount of fuel and blocks to gasoline and distance in miles respectively. With these scaled values, we can calculate how much carbon emissions were prevented by referencing average carbon emissions per mile by consumer automobiles, which is 400 grams of CO<sub>2</sub> per mile and 8,887 grams per gallon according to the EPA. The formula is  $(8887 * (\text{Fuel Used} * 0.05)) / (\text{Blocks} * 0.25)$  to get the amount of CO<sub>2</sub> emitted per mile. Then we display the difference from the national average.”



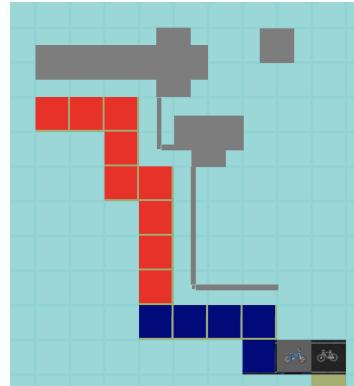
**Figure 5.4: Star Test and Event Sheet**

The above system is representative of our test to implement scoring into our game. As seen it's a simple format where if a car drives and hits a coin it registers as a 'Point' and directly influences that game screen shown upon hitting 'submit'. The more points that you have (in reference to the test) the more stars will be displayed on the end screen. This will be used in tandem with the described emissions bar and a time tracker to measure the time of your commute to rate how your path 'scores'.



**Figure 5.5: Further Motion Event Sheet**

The first image stops the car from being dragged over and dropped onto these border objects stopping it from entering certain areas. It also stops trails from being created on these borders. The second image allows switching of the traveling object on-screen from car to bike or bike to car by pressing the respective buttons and destroying the previous sprite and replacing it. The third image disables the car from entering the bike path and also destroys bike trails and removes car sprites to the start of the path if car switching happens over the bike path.



**Figure 5.6: Example Test Run**

Here is an example run of our test program, where the car has traveled some distance and left a red trail to indicate. Partway through the user switched to the bike to prepare for the bike-only section that the car would be rejected from entering. We will implement these concepts directly into the real map for our game.

The screenshot shows a GitHub repository interface. On the left, there is a sidebar with navigation links like 'Code', 'Issues', 'Pull requests', 'Commits', 'File browser', 'Raw', and 'Raw diff'. Below these are sections for 'Event Sheets', 'Fonts/Monserrat', 'Icons', 'Images', 'Layouts', 'Object Types', 'Timelines', '.DS\_Store', '.gitignore', 'README.md', and 'project.c3proj'. The main area displays a list of commits:

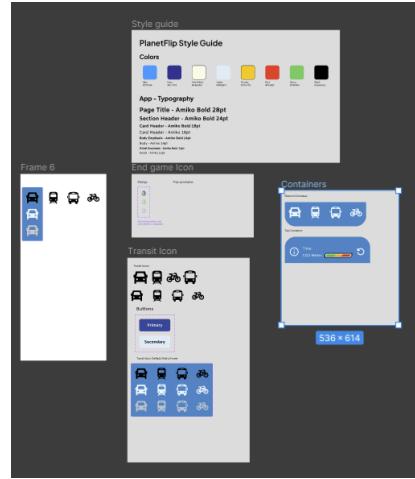
- stunuguntla21 Merge branch 'new' of https://github.com/Lucas22368/ENG100D... 35148f6 · yesterday 13 Commits
- Change to Motion Event Sheet
- Initial Setup of project files
- Initial Setup of project files
- Further Grid System
- Merge branch 'new' of https://github.com/Lucas22368/E... 35148f6 · yesterday
- Further Grid System
- Initial Setup of project files
- Further Grid System
- Initial commit
- Further Grid System
- CHANGELOG
- ENG100D\_WIN24\_GROUP

On the right, there is a detailed commit history for the 'ENG100D\_WIN24\_GROUP' branch:

- Create TimerLayout1.c3p
- stunuguntla21 committed yesterday
- Change to Motion Event Sheet
- B3DAN committed yesterday
- Further Grid System
- B3DAN committed yesterday
- Adding some additional borders
- B3DAN committed 2 days ago
- Top, right, and right corner border working
- B3DAN committed 2 days ago
- Commits on Feb 29, 2024
- Changes to implement Barriers
- B3DAN committed 2 days ago
- Changing Motion to drag & drop
- B3DAN committed 3 days ago
- Commits on Feb 27, 2024
- Redo tile movement and grid system
- Lucas22368 committed 4 days ago

**Figure 5.7: GitHub Layout and Commit History**

One of the key components of our design is making sure it can be passed on. We have implemented GitHub version control to have every individual file needed but a log of all the changes and processes we've gone through. This repository's information can easily be transferred to another team or Planetflip for further experimentation and implementation.



**Figure 5.8: UI Style Guide and Figma Component Library**

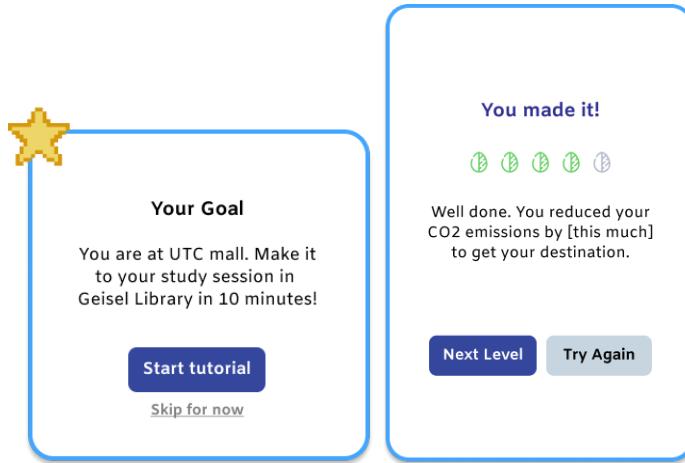
Since multiple designers are all working on the design prototype, we drafted a style guide and created components for each UI element to ensure the consistency of our design. This library includes set rules for color coding, page dimensions, and unified UI components that help easy implementation in the later development process. The icons were chosen from IconFinder because of their modern and minimalist design while still retaining enough detail for the user to differentiate the modes of transportation.



**Figure 5.9: Pixel Art Map**

The pixel art for the map is based on La Jolla because we wanted to make the game experience relatable for San Diego residents and the UCSD community. The artwork was created on software called Tiled and the tileset art was used from itch.io. Tiled is a software that takes image files called tilesets and by selecting parts of the

tileset, you can stamp a select part of the tileset to put together and create your own map and routes. The artwork used free tileset templates from artists [Adam Saltsman](#) and [Eder Munizz](#). This focuses on the decision principle of desirability and usability because our focus users will have a better mental model of the geographic locations of places in San Diego which makes the game easier to understand and create routes. The pixel art also creates a playful atmosphere that makes the experience more enjoyable and desirable.



**Figure 5.10: Informational Tabs**

Informational tabs were designed to grab the user's attention and focus it on a singular page of information while still keeping them connected to the main play page. They were created in Figma. These design decisions are focused on usability and feedback. Each tab has a white background to contrast the colors and clutter of the main page and a blue border to outline the importance of the information. Star icons are present in the welcome/goal page to highlight the most important goal for the user. These decisions make it easier for the user to quickly absorb the information and move to the next step. Other buttons include Start Tutorial, play, Next Page, Next Level, and Try Again which all have the same function to bring the user to the next step or page. These buttons are colored a deep blue to differentiate the usability of the buttons.



**Figure 5.11: Top Metrics Bar**

The top metrics bar includes information about the user's current route such as time (how long their route takes) and CO2 meter (how much CO2 their route produces).

We had to design for the lack of space so we minimized the metrics as much as possible while still keeping their usability to a maximum. This meant a short title for what the metrics described and color indication to show if their route's CO2 emissions were good/green or bad/red. The information button and reset button were included on opposite sides of the bar to maintain touch and function distinction and the icons were chosen because of their minimal and modern look. These decisions were based on usability because they aided the user in measuring how well they were doing in the game, reminding them of their route goal, and allowing them to make mistakes and rectify them.

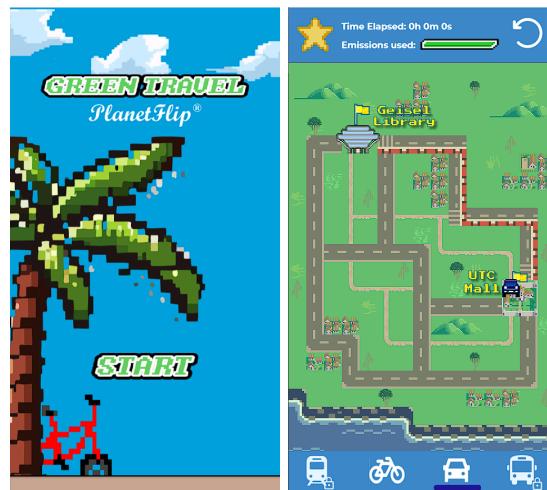


Figure 5.12: Final Screens on Construct3

This is our final look and design overall. On the left of 5.12, we have our start screen with an animated bike that moves to the right on a press of the start button. From there, we have an interactive tutorial as shown previously where the user is then able to pick up the car and attempt to move it to the Geisel library in as little time and fuel as possible. The combination of time and fuel factor determines the ending score.

## 6. Implementation & Impact

### 6.1 Implementation

Continuing off of the previous team's designs and wireframes, we made it to their milestone 3 of a built game that can be initially tested. Our process consisted of a

level design being created by a sub-team while a different sub-team completed coding tests to establish the feasibility of design elements. Once both design and testing were done, they were both brought together in Construct3 to make up the current Level 1. While some design features (such as an undo button or multiple modes of transport) had to be scrapped or delayed, our team was able to produce a level 1 consistent with the previous team's initial design elements but our own continuation and mechanics. We were not able to establish the 3 level goal we had set out for but we were able to provide a proof of concept.

### **Roadmap:**

#### **Milestone 1: Work with Ron and GND to get feedback and changes to our design**

- Our design is missing mechanics from Ron's original vision due to time constraints and both project partners should be consulted in moving forward with new game mechanics and ideas

#### **Milestone 2: Implement additional levels that increase in size and difficulty**

- Adding more levels that include more transportation options as well as more choices for the player, and including quality of life improvements such as music and bug fixing

#### **Milestone 3: More extensive Beta testing**

- After more mechanics have been implemented to provide a fuller game, it should be extensively tested to ensure that our partner's ideals are upheld and the game remains exciting and informative

#### **Milestone 4: Integrate into PlanetFlip**

- After it has been tested, the game will need to find its home on the PlanetFlip website so that it can reach more users.

**Table 4.1: Resource Assessment**

Distribution	Activities	Capabilities	Responsibilities				Still Needed?
			ENG 100D Team	Ron/ PlanetFlip Team	Next ENG 100D Team	UCSD GND	
<b>PlanetFlip</b>	<b>Design</b>	Initial Game Mechanic + Style	x				Documentation of the current level and possible ideas to explore in the next level to pass on to the next team
		Figma Wireframes	x				
		User Testing of Figma Design	x				
	<b>Implementation</b>	Construct3 Prototype	x				Iterate on the current level and add more features (like more transit options) in the next level
		Integration with the PlanetFlip App		x	x		
	<b>User Testing</b>	Alpha Test within PlanetFlip and Developers		x	x		More extensive user testing. Need more participants from the targeted user group to test the prototype
		Beta Test with UCSD GND Members		x	x	x	
		Live feedback post-implementation into PlanetFlip		x	x	x	
	<b>Maintenance</b>	Post-wireframe survey adjustments			x		Construct 3 implementation from the next ENG 100D team, ongoing maintenance by Ron/PlanetFlip team
		Post-implementation adjustments			x		
		Live debugging and maintenance		x			

## Engagement Strategies:

Our emphasis has been on mapping user experiences into the game so they can have a mapping of their real-life potential commutes into the game. Exploring the different routes within the game would then hopefully engage them in taking real-life action within their commute. In terms of what would turn people away, bugs and a gameplay interface that is frustrating to use would be the most likely causes of frustration. User testing to understand where sticking points in the product will be extremely important moving forward.

## 6.2 Failure Analysis

**Table 4.2: Failure Analysis**

Failure Modes	Effects	Severity (1-10)	Occurrence (1-10)	Detection (1-10)	Risk Score (S*O*D)	Action
Game is not visually appealing, blurry images	User doesn't want to play again	6	5	4	120	User feedback on visuals, review image file quality between Figma and Construct3
Game is not fostering climate action awareness	User don't learn how to be climate conscious in their commute	5	3	3	45	Include information on how users can be impactful in their commuting decisions
Gameplay is confusing, not intuitive	Users don't know how to play	8	4	3	96	User feedback on play experience, identify where it is unclear, and design solutions
User gets stuck in border caused by a moving mouse too quickly into borders	Users might get stuck or get a worse score as a result.	7	3	5	105	Update border logic in games/ change mouse movement to keyboard movement.
As more levels	Higher	7	5	6	210	Simplify coding

develop coding gets more complicated and logic can fall apart.	levels would be unenjoyable/ too buggy.					or future level designs so that the extensions don't break the game.
PlanetFlip website going out of service.	Users will not be able to play the game	10	1	5	50	Not much to do on the developer end other than switching to another platform that hosts construct 3 files.
Any bugs that users can encounter.	Users will have a less enjoyable experience or be unable to progress.	6	8	5	240	User testing should be done so that bugs can be spotted and fixed.
GitHub Conflicts.	Can cause data to be lost/reverted.	8	3	3	72	It's quite hard to tell when this will happen so version control needs to be implemented. This way when 2 changes are trying to be made at once it won't potentially cause GitHub conflicts.

## 6.3 Monitoring & Evaluation Plan

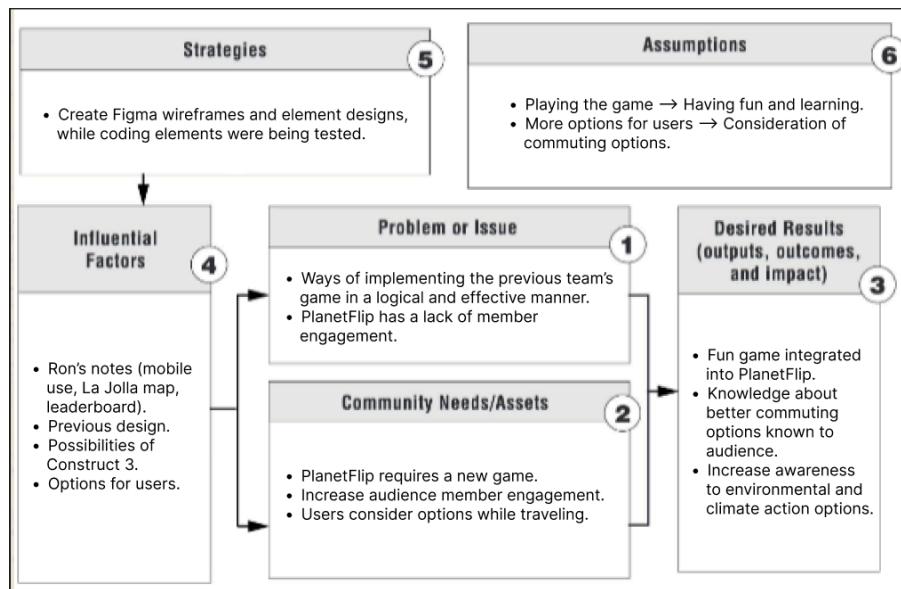
### Breadth (How Many):

Our impact is aimed immediately at those in our partner organization, UCSD Green New Deal (GND), as we are directly working with PlanetFlip. We primarily want to reach those in the climate action organization, but also extend it to other climate

organizations who interact with UCSD GND. Beyond those organizations, we want the game to reach out to others who care about climate change or who hear about it through PlanetFlip.

### **Depth (In What Ways):**

With our finished prototype, our game will be able to impact PlanetFlip by increasing member engagement. By adding a new game to their website, it increases the diverse content within PlanetFlip, allowing more people to have access to engaging ways to learn about how to address climate action. With our game addressing a daily action such as commuting, it enables a way for users to reflect on their impact on the environment, along with methods they can use to aid climate action. Everyone who plays our GreenTravel prototype should be able to leave with a reformed opinion regarding commuting and their individual efforts toward climate action.



**Figure 5: Theory of Change Model**

**Table 4.3: Evaluation table**

	Objectives	Indicators	Baseline	Target	Data Source	Frequency
<b>Inputs</b>	Base Game Creation with Working Mechanics	Survey Feedback	50%	100%	Feedback from User Testing	Once
<b>Outputs</b>	Fully Developed Level	Feedback from Project Partners	0%	50%	Feedback from Ron and UCSD GND members	Once
<b>Outcomes</b>	Starting Point for Further Game Levels Development	Implementation of our Recommendations	30%	100%	Feedback from Next Quarter Group	Once
<b>Impacts</b>	Increased Awareness of Transportation Methods and CO <sub>2</sub> Emissions	Users Spending More Time for a Higher Score	10%	20%	GND Evaluation/Feedback Survey After Game	Once a Month

## 6.4 Ethical Analysis

The UCSD Green New Deal is the organization that we are looking forward to benefiting the most because we want to address their member retention issues. The library of games on the PlanetFlip, including our own, helps draw members in with engaging activities and competition. This would help the Green New Deal and its members keep up with other members and organizational events, while also introducing them to an ecosystem of climate-conscious organizations.

This would also help the residents of La Jolla who would have been stuck in traffic because more people using public transportation would result in less traffic congestion and would help reduce harmful emissions in the La Jolla area. It could reduce the risk of people aggravating or developing health issues like asthma, heart disease, cancer, etc. due to the improvement of air quality from a decrease in vehicle emissions.

UCSD students would also benefit as currently on campus there has been a growing movement to electric scooters and bikes which have minimal emissions because of rechargeable batteries and are far more efficient than driving faster cars. Especially on campus, the ability to rent a scooter/bicycle based on need along with the ability to park it conveniently around campus is a huge benefit for students who are in a rush to get from point A to point B. With the same principle, the use of normal bikes as opposed to cars can be beneficial to the environment and also easier to use and requires less maintenance even if it takes more time for transportation as a tradeoff.

Overall, by using the app focused on sustainable emissions it motivates and fuels users, who are primarily students and young commuters, to be cautious about how they use their emitting vehicles and consider the tradeoff for longer time and physical exercise by using a bike, which will also lower their carbon footprint and cost for fuel. By using the app the users will be able to gauge how much emissions have been saved or spent.

However, as a result of the app's implementation, there may arise some unintended consequences. For one, our game is not an accurate representation of traffic conditions because it lacks things like road closures, traffic congestion, accidents, and stop lights. This may lead to people viewing the car as the best option, as it is the fastest form of travel in our game, and car traffic could potentially increase overall times. There are also new posed risks when opting toward bicycles as a more environmentally friendly option since it can lead to more accidents or issues with safety given that people generally feel safer in cars than as pedestrians.

Due to a higher demand for public transportation, buses and trolleys may become more crowded. This may present a big challenge during rush hour when public transportation is already plenty busy. This would be harmful to those who only rely on public transportation because they potentially have to compete for a seat on a bus or trolley or have to be inconvenienced in their accommodations.

Another problem that may arise is a concept called moral licensing, in which someone who engages in a positive action may later feel justified in indulging in something immoral. How could we manage the fact that people may play this game and commit to green travel but then feel justified in not committing in real life? This would be counterproductive to our goals and merits consideration.

## **7. Conclusions & Recommendations**

Green Travel has a lot of potential. We spent the duration of our time with the project designing and creating the basic mechanics of the game to create room to grow for the teams following us. Our level 1 is a proof of concept that Green Travel cannot only be created in the way the team before us envisioned but that it is a fun and educational game as well. For any future teams that receive our work, it will be paramount to maintain a sense of organization and documentation for this project. Already the amount of items involved in the games' creation can be overwhelming so maintaining all the different items will be a priority. The large amount of resources needed also required frequent backups as our team had to deal with data being lost or corrupted. Each member of the team should be familiar with the way that Construct3 works and if a similar design and coding split like our team had is followed, constant communication about design elements and code should be maintained. Ticketing tasks into pieces for individual work is also highly recommended.

As for where the game can go, there are many mechanic implementations that we discussed but we were limited in our scope of time. Additional modes of transportation such as Trolley and Bus would add additional layers to the routes that could be made; Ron had originally wanted an expandable and scrollable map so that expansive and complicated routes could be made; the game could become even more reflective of La Jolla and other San Diego areas in its symbols and aesthetic so that users could further identify with it; we discussed working with the GND for rewards in the form of Spin credits or other real-life incentives to spur involvement. Quality of life such as music, sound effects, and bug fixes are similar necessary improvements. Our code and design materials will give a great head start in designing what Green Travel will become for PlanetFlip and for the users who will play this game. Have fun and good luck!

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## Appendix

### Public GitHub of work:

[https://github.com/Lucas22368/ENG100D\\_WIN24\\_GROUP.git](https://github.com/Lucas22368/ENG100D_WIN24_GROUP.git)

### Summary of Team Meetings

- |  |                  |
|--|------------------|
| <b>1. Team Contract, Duration: 60 min</b>  | <b>1/27/2024</b> |
| a. Attendance: Aedan, Hana, Adrian, Mialyssa, Sebastian, Hogan   |                  |
| b. Main Discussion: Discuss and finalize group contract, sign contract, When2Meet created  |                  |
| c. <a href="#">Notes</a>   |                  |
| <b>2. Beginning Report 1, Duration: 60 min</b>   | <b>1/30/2024</b> |
| a. Attendance: Aedan, Hana, Adrian, Mialyssa, Sebastian, Hogan, Lucas, Sujit   |                  |
| b. Main Discussion: Tested professor's access codes for Construct3, made HMW statement, discuss goals and objectives for Project 1, prep questions for Ron   |                  |
| c. <a href="#">Notes</a>   |                  |
| <b>3. Interview with Ron, Duration: 45 min</b>   | <b>1/30/2024</b> |
| a. Attendance: Aedan, Hana, Adrian, Sebastian, Hogan, Lucas, Sujit   |                  |
| b. Main Discussion: Walkthrough of Construct3  |                  |
| c. <a href="#">Notes</a>   |                  |
| <b>4. Report 1 Delegation and Roles, Duration: 60 min</b>  | <b>2/1/2024</b>  |
| a. Attendance: Hana, Aedan, Sebastian, Mialyssa, Lucas, Sujit, Hogan   |                  |
| b. Main Discussion: Delegated parts of report to work on, group think on general notes and decisions for report sections, consider possible roles for group  |                  |
| c. <a href="#">Notes</a>   |                  |
| <b>5. Planning out Week 5, Finalizing Report 1, Duration: 50 min</b>   | <b>2/9/2024</b>  |
| a. Attendance: Adrian, Hana, Hogan, Mialyssa, Lucas, Sebastian, Aedan  |                  |
| b. Main Discussion: Finalized roles: Project manager, coders, designers, researchers/interviewers, documenter, planned out schedule for the rest of the quarter, established big milestones for each week, follow up on Emma and Ron for interviews, finalize project sections by Saturday and review Sunday |                  |

c. [Notes](#)

**6. Design Sketches, Duration: 30 min**

**2/13/2024**

- a. Attendance: Hogan, Sebastian, Hana, Mialyssa, Adrian, Lucas
- b. Main Discussion: Sections of project report 2 mostly assigned, went over WIPP presentation guidelines, design ideas presented, Agreed on: 4 modes of transportation, Color coding per mode, Fuel tank vs meter, Grid method (similar to last year), Time constraint + fuel/eco constraint

c. [Notes](#)

**7. Friday meeting, Duration: 60 min**

**2/16/2024**

- a. Attendance: Hogan, Mialyssa, Hana, Sujit, Sebastian, Lucas
- b. Main Discussion: Updated project report 2 responsibilities to align with group roles, booked interview with Emma Rodriguez, delegated WIPP project, went over the games' preliminary mechanics, went over feedback from Ron Kagan, refined brainstorming.

c. [Notes](#)

**8. Interview with Emma, Duration: 30 min**

**2/17/2024**

- a. Attendance: Mialyssa, Hana, Aedan
- b. Main Discussion: Discussed target audience, PlanetFlip's role in GND, GND core mission and goals, Emma Rodriguez's introduction, challenges faced by the previous team, incentive system, goals for the game, takeaways from the game, simplify the game and make it relatable. Reach out to potential collaborators.

c. [Notes](#)

**9. Project Report 3 Preparation, Duration: 30 min**

**2/24/2024**

- a. Attendance: Aedan, Sujit, Hana, Hogan, Lucas, Sebastian
- b. Main Discussion: Went over design and coding progress, and went over Project 3 guidelines.

c. [Notes](#)

**10. Project Report 3 Outlining, Duration: 60 min**

**2/27/2024**

- a. Attendance: Sebastian, Lucas, Hana, Adrian, Hogan, Sujit, Mialyssa
- b. Main Discussion: Shared design prototype, outline notes and assigned sections for Project 3, assigned coding responsibilities, outlined survey

c. [Notes](#)

- 11. Project Report 4 Preparation, Duration: 60 min**      **3/7/2024**
- Attendance: Adrian, Sebastian, Sujit, Lucas, Hana, Adrian, Mialyssa, Hogan
  - Main Discussion: Went over components in Project 4, assigned sections to pairs, and looked over final presentation guidelines.
  - [Notes](#)

- 12. Project Report 4 and Prototype Checkpoint, Duration: 90 min**      **3/8/2024**
- Attendance: Adrian, Sebastian, Sujit, Lucas, Hana, Adrian, Mialyssa, Hogan
  - Main Discussion: Shared current prototype and discussed potential changes and problems, finished outlining Project Report 4, looked over parts of Final Presentation, began outlining presentation and assigning parts
  - [Notes](#)

## Stakeholder Interviews

Emma Rodriguez - GND Campaign Coordinator

### ProjectFlip Questions

- Can you tell me a little bit about your role and experience with the Green New Deal Org?
- How does PlanetFlip play a role in the organization's goals?
- Who is the target audience?
- Are there any specific goals/components/mechanics surrounding your climate change initiatives that you would like to see in the commuting game?
- Are there any challenges or limitations that the previous team faced?
- How can we create a reward system/user initiative in our game?
- What can players take away from the game?

### General Project Questions

- Who else do you recommend contacting for this project?
- What essential milestones should we keep in mind for the game's design?
- Can you tell me about any constraints we should know about the project?

## User Testing - Survey Questions

Likert Scale Questions - 1 to 5 scale
<ul style="list-style-type: none"><li>• How user-friendly do you find the commuting game on the PlanetFlip prototype?</li><li>• How would you rate the clarity of instructions provided in the tutorial?</li><li>• How would you rate your desire to play this game again?</li><li>• How would you rate your desire to play further levels of increasing difficulty?</li></ul>
Multiple Choice Questions
<ul style="list-style-type: none"><li>• Do you feel that a bigger map would enhance the game's experience?</li></ul>
Open Ended Questions
<ul style="list-style-type: none"><li>• Do you have any additional comments, suggestions, or feedback regarding the commuting game? For example, possible ideas for new features or new levels.</li><li>• Are there any specific challenges, difficulties, or bugs you encountered while using the commuting game prototype? Please elaborate.</li><li>• How do you feel about using alternative travel choices after playing the game?</li></ul>
Demographic Questions
<ul style="list-style-type: none"><li>• What is your name?</li><li>• What year are you in college?</li><li>• Are you a member of the UCSD Green New Deal?</li><li>• What method of transportation do you mainly use to commute to school/work?</li><li>• Do you use a combination of two or more methods of transportation?</li></ul>

\* Note: include a question about age in future surveys