University of California, San Diego Global TIES

Course: ENG 100D, Winter 2024

Instructor: Anh-Thu T. Ngo

PlanetFlip B:
Air Pollution Simulation Game

Final Design Report

March 19, 2025

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Executive Summary

Air pollution remains one of the most serious environmental challenges, contributing to climate change, public health risks, and economic instability. Many individuals lack awareness of how their daily actions contribute to pollution and the potential long-term consequences on both human health and the environment. To address this issue, our team developed the Clean Air Challenges, an interactive simulation game designed to educate players on air pollution and sustainable decision-making. By integrating gamification, real-world scenarios, and immediate feedback, our game makes environmental education engaging and accessible to a wider audience.

In partnership with the UC San Diego Design Lab, we designed and implemented a game using Construct 3, where players navigate daily life situations and make choices that affect air quality, personal health, and financial cost. The game features a dynamic scoring system based on eco-points, convenience, health, and budget, reflecting the real-world trade-offs individuals face when making environmentally conscious decisions. By providing education feedback and interactive challenges, the Clean Air Challenges aims to bridge the gap between awareness and action, encouraging players to engage more sustainable behaviors in their everyday lives.

This project follows a human-centered design approach, incorporating user research, iterative prototyping using Figma, and feedback-driven improvements to enhance usability and education impact. Through user testing and interactive design, we refined our prototype to ensure high usability and engagement. Early feedback indicated strong usability and positive feedback responses to the decision-making ideas. As we move forward, our focus will be on enhancing interactive storytelling, refinding education content, and improving long-term engagement strategies. The final version of the Clean Air Challenge will be implemented on Construct 3, a game platform that is free to play onlines to reach a wider audience and encourage meaningful environment change. By making climate education more interactive and accessible, we aim to encourage individuals to make informed, sustainable choices that contribute to a cleaner and healthier future.

1. Project Management

1.1 Motivation, Goals & Objectives

Our objective is to use Construct3 to develop an environmentally-focused online mobile game to encourage climate change action by SoCal climate groups. We are implementing four key criteria in the game: fast-paced and fast-loading gameplay, easy-to-understand instruction with intuitive controls, aesthetically pleasing and visually stimulating design, and realistic flow, ensuring a smooth and engaging experience. Through this game, we aim to raise awareness about how to reduce pollution and highlight how daily routines can negatively impact the environment. Additionally, we want to show the long-term effects of pollution on our bodies and the planet.

Three goals specified with sub-sections:

1.) Goal 13. Take urgent action to combat climate change and its impacts
    - Goal 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
2.) Goal 3. Ensure healthy lives and promote well-being for all at all ages
    - Goal 3.9 Substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination
3.) Goal 11. Make cities and human settlements inclusive, safe, resilient, and sustainable
    - Goal 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

SMART Goals:

1. Define the game's focus

- Specific: Figure out the types of pollutants (e.g. air pollution, water pollution, waste) that we want to focus on.
- Measurable: Finalize 1-3 main topics.
- Attainable: Research and discussions to help make a well-informed decision.
- Relevant: Apply clear connections to selected SDG goals and environmental awareness.
- Time-bound: Complete within the first week.

2. Outline game mechanics

- Specific: Create a document that includes detailed objectives, outline of gameplay, and educational components.
- Measurable: Write a 1-2 page design document.
- Attainable: Use previous brainstorming and references to similar educational games.
- Relevant: Define the overall game structure for development.
- Time-bound: Complete within a week.

3. Prototyping

- Specific: Implement basic choices where the player selects daily life choices that impact pollution.
- Measurable: Create a prototype where the player can make an environmental choice and see its impact at the end.
- Attainable: Use Construct 3's scripting and assets.
- Relevant: Establish core mechanics for further development.

- Time-bound: Complete within a week

4. Connection with SDG Goals

- Specific: Create a couple educational messages about pollution and reduction based on the player's choices.
- Measurable: Show a pop-up message or NPC dialogue that reflects the consequences of the player's choices.
- Attainable: Research sources and simplify the information for players.
- Relevant: Make sure the game aligns with SDG 13.3 and 3.9
- Time-bound: Complete within a week (same week as the "Prototyping" stage).

5. Visuals and game interactions

- Specific: Develop player interface, environment, and pollution indicators, and add more interactive elements such as pollution calculation or impact summary.
- Measurable: Add at least 5 visual assets and two working mechanics
- Attainable: Use basic assets and plan for finalization.
- Relevant: Enhance engagement and educational impact for the player.
- Time-bound: Complete within a week

6. User testing and feedback

- Specific: Undergo two user testing sessions and collect feedback on usability, engagement, and educational components.
- Measurable: 3-5 testers per session
- Relevant: Make sure that the mechanics are easy to understand and the content is engaging.
- Time-bound: Complete within a week.

7. Finalize the game mechanics and improve usability

- Specific: Identify gameplay issues and implement minor UI improvements.
- Measurable: Resolve at least three main issues during user testing.
- Attainable: Prioritize most critical issues during user/playtesting.
- Relevant: Make sure the final product is polished and functional.
- Time-bound: Complete within a week (same week as #6)

1.2 Approach

Approach to design challenge (strategies, tools, and methods)

To address environmental pollution in an interactive and engaging environment, our team uses a human-centered design approach that includes research, prototyping, coding, and evaluation to ensure that our design game effectively motivates players to take real actions or to better understand and empathize with the impact of pollution on the environment. We will analyze the interdependencies between social, industrial, and environmental factors that contribute to pollution. We plan to collect data through interviews and research to identify key observations. We will utilize a Gantt Chart to track our weekly progress and assign specific tasks based on each team member's skills to track our projects. Our design and prototyping will be done using Figma or Sketch for UI/UX design, and programming will be implemented in Python using Construct 3. Through online research and surveys, we will gather background information and identify key challenges related to pollution, such as air, water, soil, etc., to ensure our game is both impactful and entertaining.

We plan to conduct primary and secondary research to identify user needs and challenges faced towards climate-action-related games and the effectiveness of our potential solutions. An online survey will be distributed to collect quantitative data on users' awareness and current strategies to reduce major types of pollution. We will also conduct semi-structured interviews to collect more qualitative data on people's attitudes towards pollution and gaming, as well as the challenges of engaging in climate action. Our target users are mobile gamers and environmental advocates. As for secondary research, we will do online research to understand the current situation of major global pollution, including sources, trends, health impacts, and strategies to reduce pollution. We will also conduct a competitive analysis to look into existing environmentally-focused games in southern California. Their strengths and weaknesses will be analyzed to help us identify design opportunities.

Project management strategies

We will carry out standardized work processes to ensure efficiency, punctuality, and flexibility. Based on the Gantt chart, we will hold weekly meetings with a set agenda that basically includes progress updates, feedback, upcoming tasks, etc. Specific agendas may vary according to needs in different phases. Meeting notes, tasks, and all documents will be stored in a shared Google Drive to promote accountability. Throughout each week, we will communicate via phone messages to keep the entire team updated.

Potential Interview Questions

1. Warm-up
    a. Can you describe some major pollution issues affecting San Diego?
    b. What types of pollution are most common in San Diego?

    c. What are the most notable effects of pollution on the environment and public health?
2. Main body (pollution-related)
    a. What steps can individuals take to reduce pollution in their daily lives?
    b. Do you use public transportation, walk or bike instead of driving? If driving, how often do you drive a car each week?
    c. How often do you recycle items like plastic, paper, glass?
        i. 1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always
    d. Do you check air quality levels before going outside? Why or why not?
    e. What methods can individuals take to reduce pollution in their daily lives?
    f. What do you think are the most effective ways to reduce pollution?
3. Main body (game-related)
    a. What type of game do you enjoy the most? (e.g. adventure, competitive) Why?
    b. What features make a game engaging and worth playing for a long time? Why?
    c. Will you be interested in a game that motivates real-world climate action? Why or why not?
    d. If you have a chance to play such a game, what features and/or resources would you like to see?

1.3 Schedule

Our project will be divided into four main phases: definition and planning, design, implementation, and wrap-up.

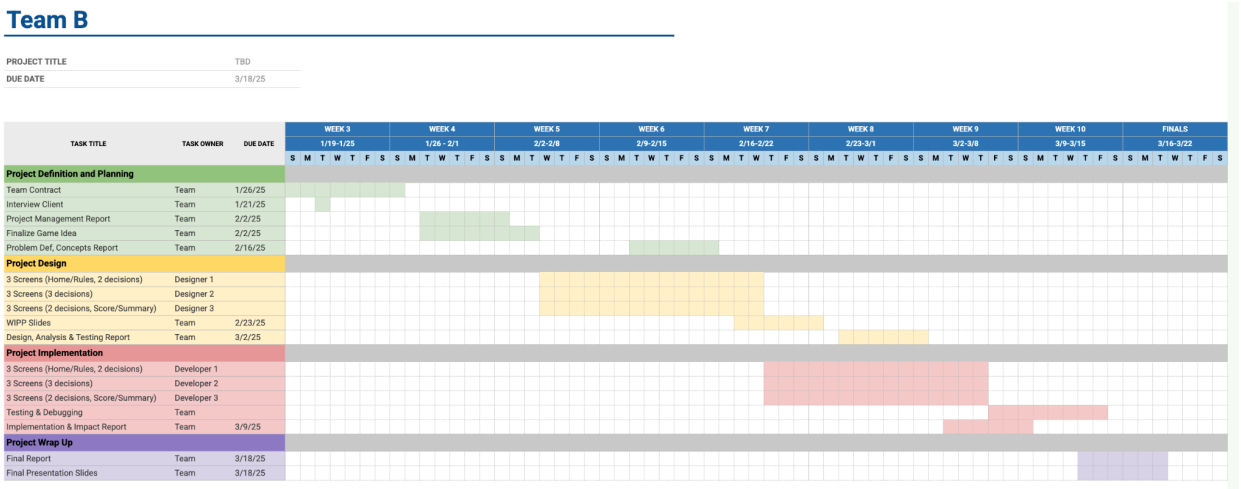
In the definition and planning stage, the tasks include interviewing the client over Zoom and finalizing the general game idea. Deliverables during this phase include the team contract, project management report, and the project definition and concepts report.

For the project design stage, we will finalize the detailed designs of the game. Each designer will design 3 screens, split up as such: Designer 1 will design the home/rules screen and two everyday pollution decisions, Designer 2 will design three everyday pollution decisions, and Designer 3 will design two everyday pollution decisions and the score/summary page. Deliverables during this phase include the WIPP slides and the design, analysis, and testing report.

In the implementation phase, we will move on to coding the game. Work will be evenly divided between the three developers such that Developer 1 implements the screens Designer 1 designed and Developer 2 implements the screens Designer 2 designed, etc. After development is complete, we will test the game with our team members and possible volunteers and debug any issues before submitting our implementation and impact report.

Finally, in the wrap-up phase, we will finalize the final report and final presentation slides before presenting them to the class.

With this four-phase structure, our team should be able to successfully produce an interactive and fun mobile game to help raise awareness about pollution by the end of the quarter.



Team B

PROJECT TITLE	TBD
DUE DATE	3/18/25

TASK TITLE	TASK OWNER	DUE DATE	WEEK 3 1/19-1/25	WEEK 4 1/26 - 2/1	WEEK 5 2/2-2/8	WEEK 6 2/9-2/15	WEEK 7 2/16-2/22	WEEK 8 2/23-3/1	WEEK 9 3/2-3/8	WEEK 10 3/9-3/15	FINALS 3/16-3/22
			S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S	S M T W T F S
Project Definition and Planning											
Team Contract	Team	1/26/25									
Interview Client	Team	1/21/25									
Project Management Report	Team	2/2/25									
Finalize Game Idea	Team	2/2/25									
Problem Def, Concepts Report	Team	2/16/25									
Project Design											
3 Screens (Home/Rules, 2 decisions)	Designer 1										
3 Screens (3 decisions)	Designer 2										
3 Screens (2 decisions, Score/Summary)	Designer 3										
WIPP Slides	Team	2/23/25									
Design, Analysis & Testing Report	Team	3/2/25									
Project Implementation											
3 Screens (Home/Rules, 2 decisions)	Developer 1										
3 Screens (3 decisions)	Developer 2										
3 Screens (2 decisions, Score/Summary)	Developer 3										
Testing & Debugging	Team										
Implementation & Impact Report	Team	3/9/25									
Project Wrap Up											
Final Report	Team	3/18/25									
Final Presentation Slides	Team	3/18/25									

Figure 1.1 Project Schedule

1.4 Team Bios

James Kim - Developer, Communication liaison with Ron:
3rd year, Graduating in 2026
Major: Applied Mathematics Major | Minor: Computer Science
He has experience communicating efficiently, getting his points across to his team members. He also has experience in coding proficiently in multiple languages.

Contact: jhk021@ucsd.edu | (818)-751-3376

	**Jiahui Li - UI/UX Designer, Researchers:** 3rd year, Graduating in Spring 2026 Major: Cognitive Science (Design and Interaction) Minors: Computational Social Science and Design. She has experience in prototyping, coding, UI/UX design with the ability to work effectively in team settings. Have skills in communication, user research, and identifying user needs, ensuring user-centered design solutions. Contact: jil319@ucsd.edu | (626)-233-5624
	**Yuntian Guo - UI/UX Designer:** 3rd year, Graduating Spring 2026 Major: Cognitive Science (Design and Interaction), Interdisciplinary Computing and Arts She has experience in user research, UI/UX design using Figma, and project management through a user-centered approach. She is proficient in crafting engaging digital solutions that empower people. Contact: yug040@ucsd.edu
	**Anna Lee - Developer, Project Manager:** 3rd Year, Graduating in Spring 2026 Major: Computer Science | Minor: Business Analytics She has experience managing diverse project teams and ensuring tasks are completed on time for project progression. She also has experience with multiple coding languages and working on team software projects. Contact: aml027@ucsd.edu

	**Santiago Duque - Developer** 4th year, Graduating in June 2025 Major: Computer Science He has experience in programming in multiple languages, collaborating in teams for software projects, and works effectively with the team. Contact: sduque@ucsd.edu | (619) 577-5904
	**Alysia Kim - UI/UX Designer:** 4th year, Graduating in 2025 Major: Cognitive Science (Design and Interaction) She has experience in design projects applying problem-solving and detail orientation to create user-friendly solutions. She also has experience in the fundamentals of UX design such as user research, wireframing, and prototyping. Contact: ask003@ucsd.edu

1.5 Stakeholder Analysis

Anh-Thu Ngo (ALLY) - Anh-Thu Ngo is the professor for the class ENG 100D. She oversees all groups within this project, and is a valuable resource when stuck. Within the matrix, she would be placed within the promoters location, as she would be closely monitoring the project, and also has a lot of influence over her students. A good strategy for engaging Ahn to boost our likelihood of success would be to consistently schedule meetings in order to show project progress, and perhaps get advice on how to improve.

Ron Kagan (ALLY) - Ron Kagan is the lead coordinator on Planetflip, which is the platform that our project will eventually end up on. As he is someone who will be overseeing our project, Ron would be placed within the promoters location. He is someone who has a lot of influence over our project, especially since this project will end up on his platform. Not only that, he is someone who should be informed from time to time because he can help us specifically on Construct 3, which is where our project will be built. A good strategy for engaging Ron would be to contact him weekly, letting him know if we need help, or even if we end up stuck.

College Students (ALLY)- Students are the main audience member for our project at this current point. They are the ones who will dictate how the future of our game goes, as their

reviews will likely influence the future updates of our games. Within the project, they are probably on the lower side of promoters just because we are catering our game towards them. A good strategy for engaging in the target demographic would be to test a couple of these students and ask them to answer a survey so that we can get feedback on where to improve and what is going well with the game.

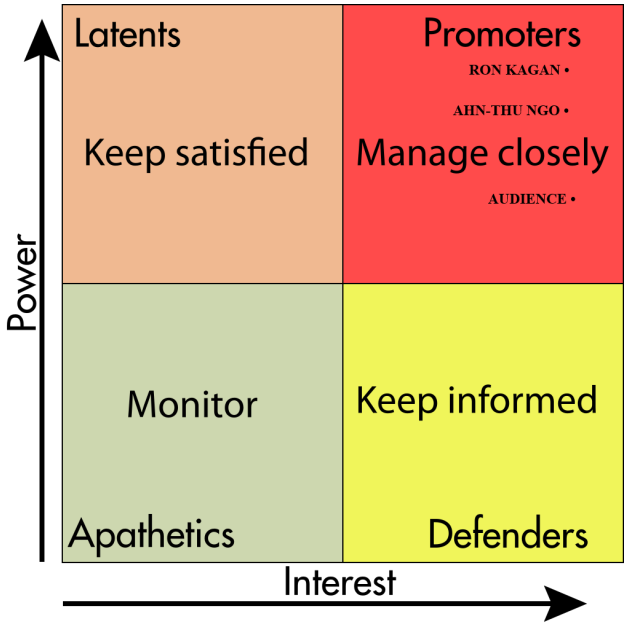


Figure 1.2 - *Stakeholder Analysis Matrix*

2. Problem Definition

2.1 Problem Statement

Environmentally conscious individuals need an interactive and engaging way to understand the impacts of air pollution because a lack of awareness and accessible information prevents them from recognizing how their daily behaviors contribute to environmental damage and health risks.

2.2 Background & Context

Pollution is one of the major problems for human and environmental health, with severe impact on social and economic structures. It can be caused by various human activities, natural processes, and wildfires. Human activities such as burning fossil fuels, transportation, and industrial emissions cause poor air quality, leading to some risks on human health (National

Geographic). Pollution exists in many ways, some major types include air, water, soil, noise, light, thermal, radioactive, and plastic pollution.

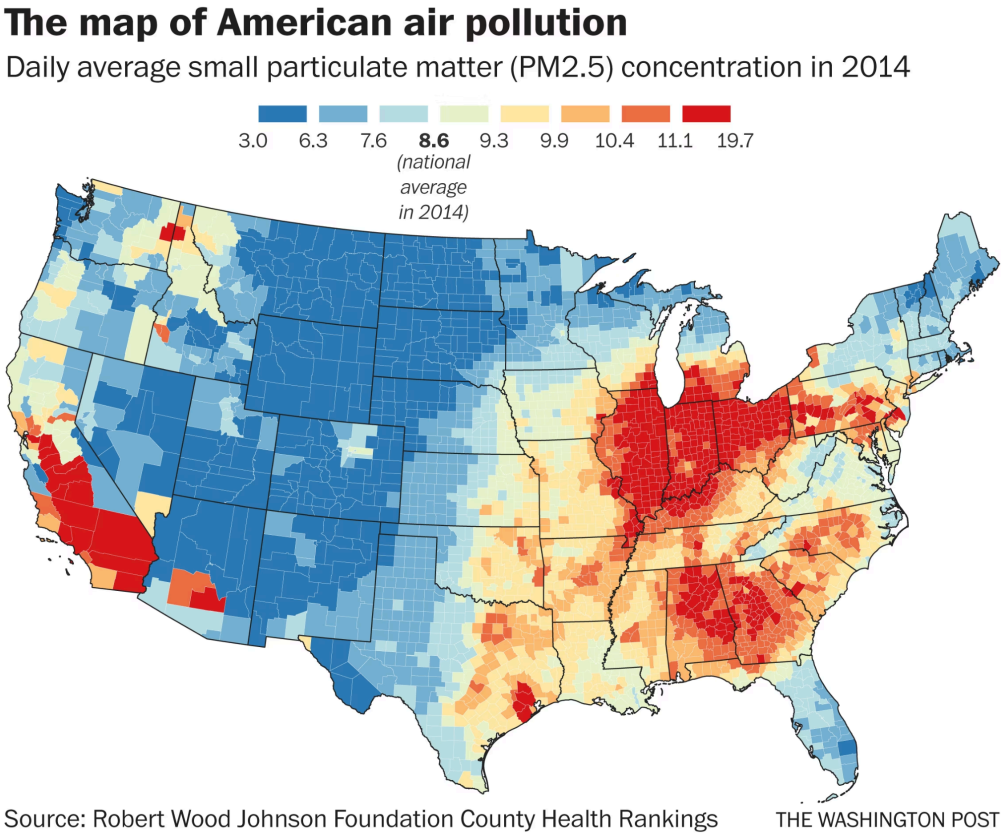


Figure 2. Preview of air pollution in the United States (Citation).

According to Wikipedia on pollution, respiratory illnesses are heightened by air pollution, which is caused by the release of harmful chemicals and particulate matter into the atmosphere. Similarly, untreated wastewater and industrial waste pollute rivers, lakes, and oceans, disrupting marine ecosystems and making the water unsafe for human consumption. Noise pollution that is caused by excessive sounds from traffic, industry, and urbanization, can also lead to hearing problems, stress levels, and sleep difficulties. Another significant concern is plastic pollution, which results from the production and improper disposal of plastics. It can be hard to break down and can remain in the environment for a long time and release harmful chemicals to the environment (Wikipedia). All these types of pollution create significant threats to the environment and public health.

Millions of individuals are impacted by this significant issue of pollution, especially low-income populations, the elderly, and children. According to the article *Nature Communications*, socioeconomic inequality can be reinforced by air pollution and these differences have increased over time (Nature Communications). Many studies have examined the economic aspects of pollution and discovered that those with lower incomes are frequently

exposed to more pollutants and may react more strongly to such pollution (American Lung Association). This may be due to the fact that affordable housing is frequently located close to pollution sources and that people with lower incomes have less access to services or healthcare systems. In the past, fast industrialization and urbanization have raised pollution, a trend that could have an ongoing effect on the environment if left unchecked. Furthermore, articles from the National Institutes of Health (NIH) reveal that Long-term exposure to pollution also raises the risk of cardiovascular and respiratory illnesses (National Library Of Medicine). Due to pollution issues and the increase of negative impact to the environment, understanding certain facts about reducing pollution is crucial for a sustainable environment.

From our interview survey, 17 out of 25 individuals expressed concerns about the effects of pollution on the environment and human health. However, 18 out of 25 respondents said they do not check air quality before going out and this can be problematic because this behavior lacks awareness about the danger of air pollution and how it impacts their health. In partnership with the UCSD Design Lab, Ron Kagan created PlanetFlip, a platform that lets organizations match people's interests with individual actions and climate change education opportunities. Building on this goal, our team decided to use Construct 3 to develop a game with the main theme of air pollution. We hope that this game will increase awareness and encourage players to take environmental and health issues into account. This way, they can keep track of their actions and see how they affect the environment in a fun and engaging way. To get a sense of their motivations and to keep the game engaging, we inquired, “What motivated you to adopt eco-friendly behavior?” The majority of responses to this question focus on protecting the environment and future generation, as well as, improving personal health and well-being. We also inquire about the frequency of recycling in order to obtain data and information. Finally, we gather user preferences by asking them what features they would like to see in a mobile game. This allows us to construct a game that appeals to the user while learning about pollution facts.

Climate Action Gaming (Responses)

2.3 User Profile(s)

Emily Klein

BIO

Emily is passionate about sustainability and tries to implement eco-friendly practices into her daily life. She recycles, avoids single-use plastics, and takes public transportation whenever possible. She enjoys playing video games as a way to relax and would love an interactive game that helps her better understand about the impact of pollution.

GOALS

- To stay motivated in making eco-friendly choices.
- To encourage her peers to adopt more sustainable habits.

WANTS & NEEDS

- An interactive and engaging way to learn about pollution's impact.
- To feel liker her daily choices contribute to environmental change.

DEMOGRAPHICS

Age: 22
Occupation: University Student
Location: San Diego, CA

RELEVANT KNOWLEDGE & SKILLS

- Familiar with sustainability concepts
- Enjoys interactive learning experiences

PAIN POINTS

- Overwhelmed by the scale of environmental issues.
- Feels like individual efforts might not make a big difference.
- Finds existing educational resources uninspiring.

Figure 3. User Profile

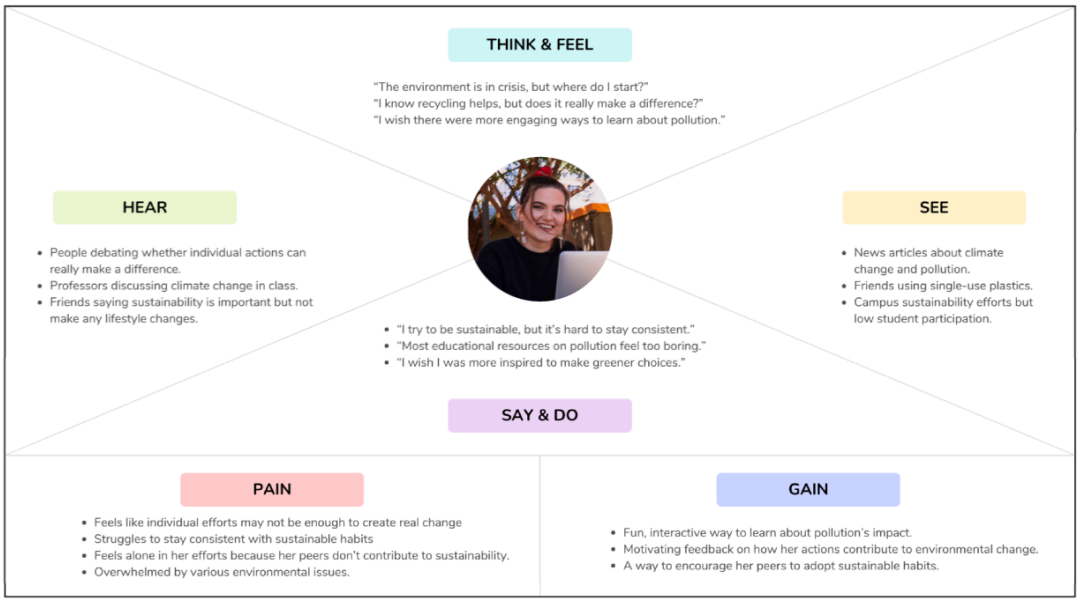


Figure 4. Empathy Map

	AWARENESS	INTERACT	ENGAGE	ADVOCACY
ACTIONS	Reads article on pollution and natural disasters	Looks up ways to reduce her carbon footprint.	Plays an interactive game on pollution's effects.	Shares experience with peers.
NEEDS	Clear, absorbing information about pollution's impact.	An engaging, interactive way to learn.	A motivating and immersive learning experience.	Visual feedback on her eco-friendly impact.
FEELINGS	😕: "This is a serious issue. Where do I even start?"	🤔: "What can I do past the basics?"	😄: "This makes learning about sustainability fun!"	😄: "This helped me understand my impact. My friends should try it too."
BARRIERS	Overwhelmed by wide range of environmental issues.	Finds existing resources uninteresting and wordy.	Many educational resources are not engaging.	Struggles to encourage others to adopt eco-friendly habits.

Table 1. Journey Map

2.4 Design Requirements

Criterion	**Requirement**
Functionality	The game must teach at least 3 key concepts about air pollution through interactive scenarios because the primary goal is to educate young adults more about the dangers and solutions related to air pollution.
Desirability	The game should be at least a ⅘ on the 5-point Likert scale because it must be engaging and entertaining for our audience.
Performance	The game must run at 60 fps on most devices because young adults and kids should be able to enjoy smooth and lag-free gameplay on any device they have access to.
Aesthetics	The game must feature modern graphics because young adults enjoy more visually

	appealing games.
Relatability	The game should include at least 1 relatable scenario and choice that reflects a real-world experience because creating realistic scenarios will deepen the audience's engagement and make the learning experience more effective.

Table 2. Measurable Design Requirements

3. Concepts

3.1 Existing Solutions Analysis

Existing solution 1: AirPocalypto: City of Smog

AirPocalypto is a mobile game with a background in a dystopian future where air pollution has caused deadly trouble in human society. Players control a character to stop pollution by clearing factories and avoiding environmental hazards or surviving by collecting gas masks.

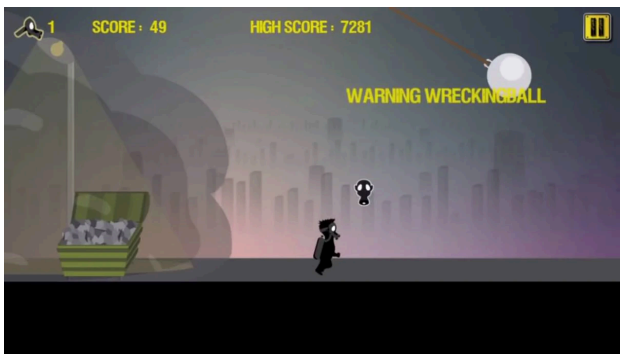


Figure 5 & 6. Game and summary screens of AirPocalypto (Citation).

One strength is that it uses the severity of air pollution consequences to raise the educational value. It offers facts about pollution and death to make the game engaging and informative. Additionally, AirPocalypto provides two game modes to bring different kinds of experiences, as one focuses on strategy and the other focuses on survival. This may appeal to a broader range of players.

A limitation is that the mechanics in “save your city” mode are quite repetitive since players’ tasks are simply leaping over obstacles and collecting filters. Players may also feel that their efforts cannot lead to any meaningful progress, as there is no clear long-term reward for

cleaning factories. As for the visual design, the settings of the dark and apocalyptic environment as well as the constant struggle to survive may be overly intense for some players. Seeing air pollution as a deadly force can be overwhelming.

Existing solution 2: Recycling Hero

Recycling Hero is a mobile game where players sort different kinds of items into the correct recycling bins such as plastics, paper, food waste, etc. within a time limit of 2 minutes. Its goal is to educate players about recycling in a fast-paced game environment, where correctness and speed are rewarded. Although it focuses on waste pollution instead of air pollution, some of its game features are worth learning and reflecting on.

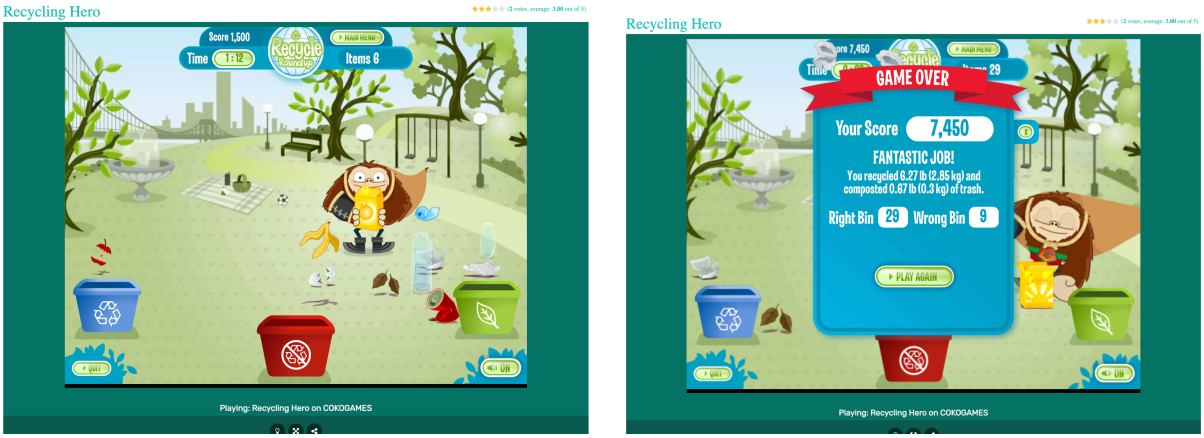


Figure 7 & 8. Game and summary screens of Recycling Hero

One strength is that it has high learnability since it provides users with clear and intuitive instructions on how to pick up items and sort them with text and animation. It also provides real-time feedback on actions by rewarding correct actions and penalizing mistakes with different facial expressions on the character's face. Besides, the summary report shows measurable outcomes, including data on recycled weights, compost trash, and performance in the end, which brings players an understanding of their impact and motivation with numerical support.

One limitation is that there is no visualization of actions' outcomes. Visual graphics may help players better grasp the significance of their choices. Also, it lacks incentives to encourage users to continue correct recycling in real life, and players may experience fatigue as the game design and storytelling is really simple.

Existing solution 3: Half-Earth Socialism

Half-Earth Socialism is a strategy and simulation game that explores environmental solutions to the climate crisis. It is a story-based web game where users act as political leaders in a post-revolutionary world. They must make strategic decisions to manage global resources and transition away from fossil fuels, industrial agriculture, and other heavy-polluting industries.

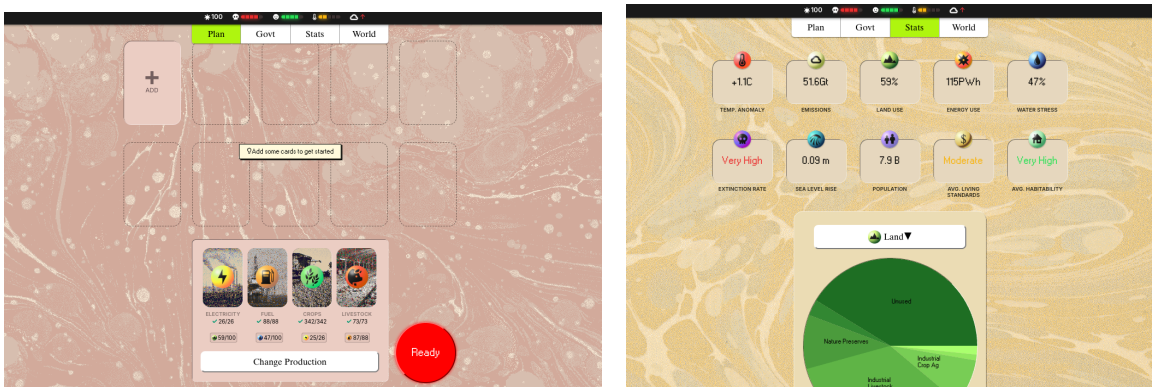


Figure 9 & 10. Game screens of Half-Earth Socialism

A strength of this game is the thoroughness of the storyline, based on actual legitimate climate science and political theory, allowing for a thought-provoking and engaging experience for users. Rising through the levels of the game requires true strategizing and consideration, making it an addictive game for those who are interested in the topic.

Some limitations of this game are that the user interface is not very intuitive for new users. Furthermore, since the user is roleplaying as a political leader, the game and decision options are not very applicable to the average person's day to day life. There is also a steep learning curve and a strong political bias written into the game, creating a more serious atmosphere and narrowing the game's possible demographic.

Gaps and opportunities

Current solutions for air pollution education have several gaps in personalization, long-term feedback, and player agency. Most solutions focus on industrial behaviors and fail to consider individual behaviors, such as commuting and food choices, that may affect air quality. Tailoring game storytelling and challenges to personal habits may promote the relevance and engagement of gameplay. Another gap is the lack of long-term feedback to encourage sustainable actions. While instant encouragement and discouragement are given for each action, the border impact of those everyday behaviors is often neglected. The opportunity here is to visualize long-term benefits, such as cleaner air over time and fewer lung diseases, to emphasize the significance of sustained efforts. Moving on, there is also a gap in a lack of player agency in air pollution solutions. For example, the gameplay of AirPocalypto focuses on physical actions such

as avoiding obstacles and replacing gas masks but overlooks real interactive choices on how to reduce pollution. An opportunity here is to give players chances to make decisions such as using clean energy, reducing factory emissions, and making urban design choices to promote sustainability. More decision-making may better motivate players to take environmental actions.

3.2 Concept Generation

Concept 1: Clean Air Challenge Simulation

Our first concept is Clean Air Challenge, a decision-based simulation where players navigate through daily occurrences in a day and make choices in scenarios, such as cooking, commuting, and temperature adjustment, to reduce air pollution and improve air quality.

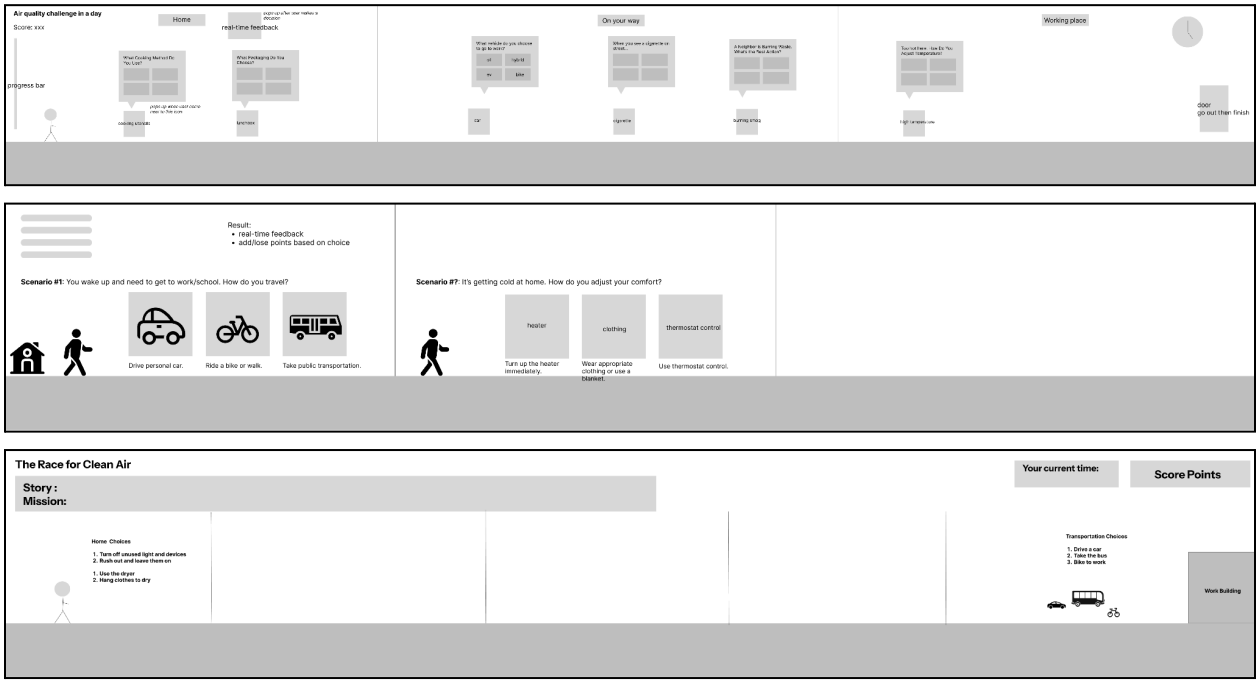


Figure 11, 12, & 13. Three early prototypes of Clean Air Challenge Simulation

By placing players into simulated scenarios where their decisions and actions can affect air pollution reflected from a scoring system, the Clean Air Challenge raises their awareness towards their everyday behaviors through education and reinforcement. It encourages environmentally friendly behaviors and prevents harmful actions in an engaging and subtle way.

Major strengths include its gamification, replayability, and real-world relevance. Clean Air Challenge gamifies education on climate actions by engaging players to actively shape air pollution outcomes in a simulated storytelling. Outcomes are presented in both quantified scores and instant visual feedback on their decisions, such as text prompts and cute animations. Players

can also replay the game to experience different levels of outcomes by making different choices. Instead of a simple right or wrong approach, choices lead to nuanced consequences. This motivates players to weigh their options carefully with consideration on tradeoffs and more real-life factors.

One weakness is that our current storytelling lacks a more thoughtful scenario design. We need to iterate on the scenarios and choice options to ensure more meaningful, educational, and balanced applications in common life occurrences. Another concern is regarding the layout and presentation of information, including game mission, scores, pop-up questions, feedback animations, etc. This may increase complexity and disrupt intuitive gaming flow.

Concept 2: AirAware Quiz

AirAware Quiz is a quiz-and-puzzle-based game where players answer questions related to air pollution, sustainability, and environmental practices.

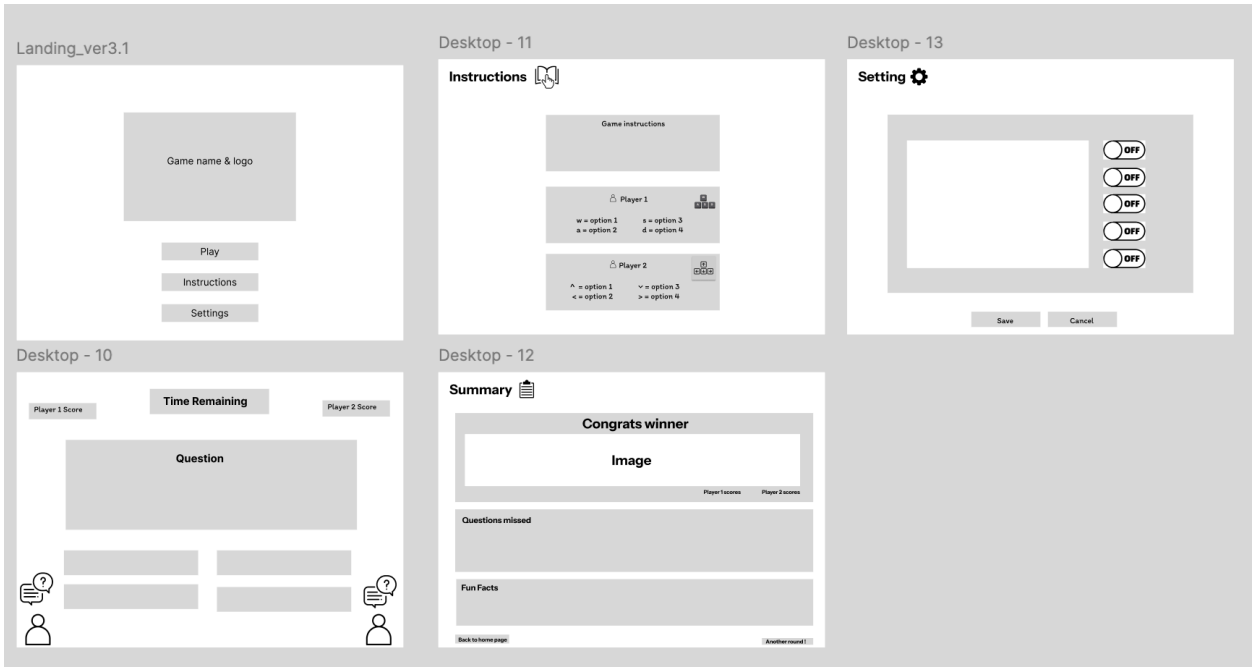


Figure 14. The early prototypes of AirAware Quiz

It simplifies complex environmental topics by incorporating quizzes and puzzles in an approachable and fun way, encouraging players to learn through problem-solving and reinforced learning. Players start with easier questions and unlock harder ones as they progress. For instance, the initial question may be about basic pollution facts, while later levels may ask about environmental strategies. After answering quiz questions, players would complete puzzles, such

as matching environmental terms with their definitions and arranging terms to form a correct recycling system.

One strength is that the quiz format mixed with puzzles keeps players involved with a balance between education and fun. Players tend to gain a sense of achievement after correctly answering a question or completing a puzzle. It also has high accessibility as quizzes and puzzles are easy to understand for a wide range of audiences.

A limitation is the potential overload of information. Quizzes are text-based and may make players feel overwhelmed or fatigued, which leads to disengagement or difficulty memorizing the information. It is important to consider how to approach balanced content of text and graphics to keep players interested. Also, it has limited emotional impact since there is not a strong narrative or emotional connection, which may make it less impactful than other games that involve immersive storytelling.

Concept 3: Trash Dash

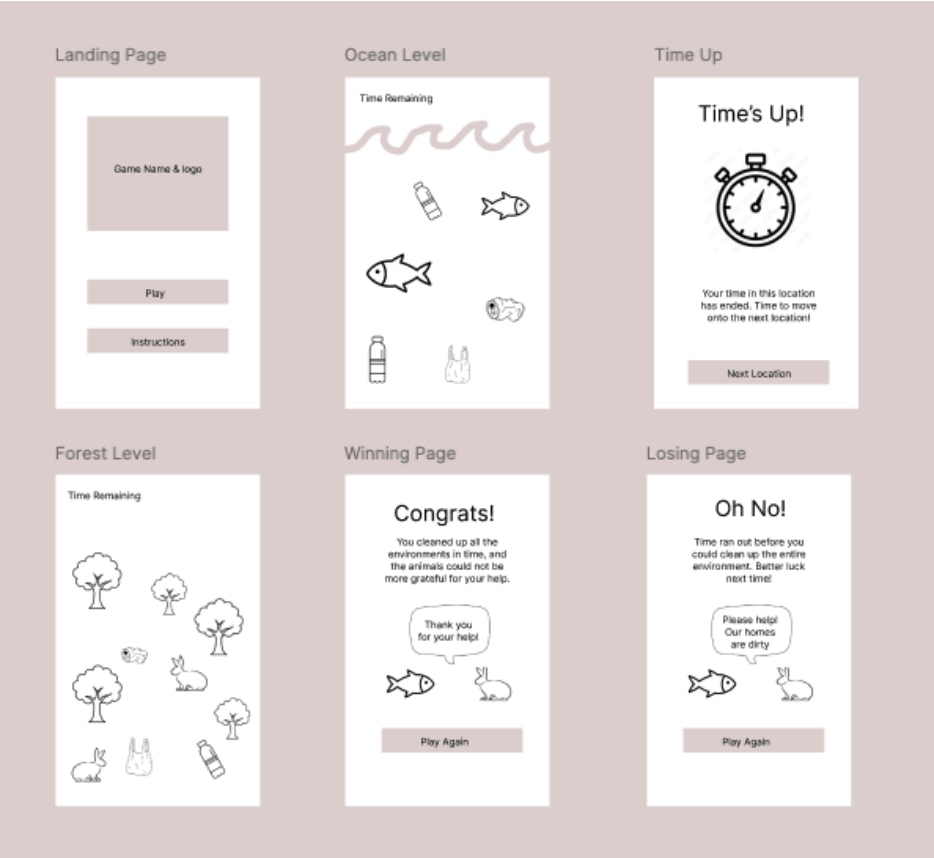


Figure 15. The early prototypes of Trash Dash

Trash Dash addresses the growing need for environmental awareness in a fast-paced way by having users go through different environmental settings (ocean, forest, city, etc.) and cleaning up the area to save the animals. Users race against a timer and tap on all the misplaced garbage items to help clean the animals' homes. If they are able to select all the misplaced trash before time runs out, they win that level, otherwise, they lose.

Major strengths of Trash Dash include its intuitive game design, fast-paced gameplay, and diversity in environments. The concept of the game is extremely simple, making it easy for any user to pick up and immediately start playing. With the timer feature and different environmental settings for the user to clean up, it is a fast-paced game that can hold the user's attention.

One weakness of Trash Dash is that it lacks an educational perspective. Users go through different environmental settings to clean up the trash, but the fact that many nature spots are filled with trash is already common knowledge. This game does not provide any further insight or call to action that can help spread awareness about climate change and pollution.

3.3 Concept Evaluation & Selection

Concept Evaluation & Selection

We selected a final concept by figuring out which concept follows our current key evaluation criteria, which includes: functionality, desirability, performance, aesthetics, and relatability. We could also include usability as well to ease accessibility of our app to users.

Low-Resolution Prototype (Capture Grid)

We are using a capture grid as a low-resolution prototype of our concepts and are now waiting for feedback from our stakeholders.

Likes: ● Realistic scenario-based decision-making ● Feedback system showing the consequences of player's actions without discouraging them ● Visual design and aesthetics	Wishes: ● I wish there were more ways to reward the player that motivates them to keep playing the game. ● I wish there were more unique, high-impact scenarios in the game.
Questions: ● What additional features would make the experience more appealing?	Ideas: ● Think of more high-impact scenarios (e.g. health, home) that are personal

• Are the current mechanics engaging enough to maintain long-term interest?	and realistic. • Customized sustainability tips for each player's choice or action • Add a leaderboard or point system to prompt competition and engagement.

Table 3. Capture Grid

Decision Matrix

To help develop a final concept, we created a decision matrix to see how well each criterion is met by each concept. Scores are assigned based on whether such a concept is better (+1), same (0), or worse (-1) compared to another concept.

Criteria	Concept 1 (baseline): Clean Air Challenge Simulation	Concept 2: AirAware Quiz	Concept 3: Trash Dash
Functionality	0	-1 (less interactive)	-1 (lacks educational perspective)
Desirability	0	0	0
Performance	0	0	0
Aesthetics	0	-1	0
Relatability	0	0	0
Usability	0	0	0
TOTAL:	0	-2	-1

Table 4. Decision Matrix

After comparing the criteria for each concept using a decision matrix, we can conclude that concept 1: Clean Air Challenge Simulation follows our criteria the best. Therefore, we will stick with this concept and create better prototypes as we work along.

4. Analysis & Testing

4.1 Overview

Our approach to evaluating our solution revolves around a user's feedback. We started out by sending out a Google Form to gather insights on user preferences for visuals and gameplay. Based on their responses, we created a storyboard prototype in Figma and shared it with users for feedback. After receiving their input, we made adjustments to improve the game's visuals, desirability, and relatability. With an updated storyboard, we plan on implementing the game in Construct 3. With the rough draft of the game, we plan on sending the game and a Google Form out to users in order to get the final feedback in order to adjust our game properly in time for the end of the quarter.

Criterion	Metric	Target Value	Resultant Value	Method
Functionality	Number of identifiable key concepts throughout the game	<= 3	6	User Testing and Feedback
Desirability	Engagement score on a 5-pt Likert Scale	<= 4	3.5	User Testing and Feedback
Performance	FPS on different devices	60 fps	TBD	Analysis on different devices
Aesthetics	Visual appeal rating on a 5-pt Likert Scale	<= 3.5	4.7	User Feedback
Relatability	Relatability rating on a 5-pt Likert scale	<= 4	5	User Testing and Feedback

Table 5. Design Criterion

4.2 Desirability & Usability

Introduction

Our project aims to create an interactive experience that engages users while educating them about air pollution and sustainable habits. Therefore, the main question we are testing is: How desirable and usable is our interactive experience in educating users about air pollution and motivating real-world eco-friendly actions? We hypothesize that an interactive, gamified approach will be both engaging and educational, which increases user motivation to adopt sustainable behaviors.

Some of the key design requirements being tested include:

1. Desirability
    a. Do the game mechanics keep users interested?
    b. Does the game content connect to users' daily lives?
2. Usability
    a. Does the game effectively accommodate our target audience?
3. Sustainability
    a. Does it inspire real-world changes to sustainable behaviors?
    b. Does the game encourage ongoing eco-friendly habits?

Methods

Our prototype consists of an interactive simulation game where users make choices that affect air quality and other environmental factors. Some features include:

- Scenario-based decision-making
- Educational feedback with sustainability tips
- Point system based on environmental impact, health, convenience, etc.

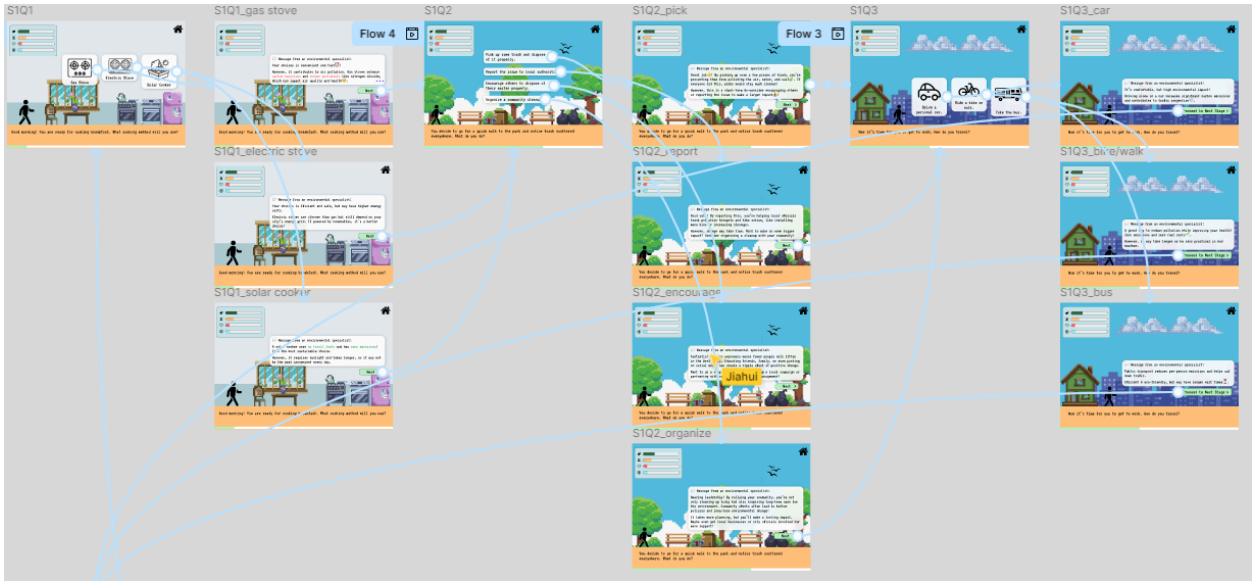


Figure 16. A section of the prototype design on Figma

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The prototype consists of three distinct stages representing a different real-world setting, each with 3-4 interactive scenarios where users must make choices that impact the environment. Some key features in this prototype include multiple-choice interactions and educational feedback, as well as an immersive progression that gradually introduces the three stages with more complex decisions. For instance, in Stage 1, users are introduced to on-the-surface scenarios such as transportation methods, while in Stage 2, they interact with more critical-thinking problems like matching the causes and effects of air pollution.

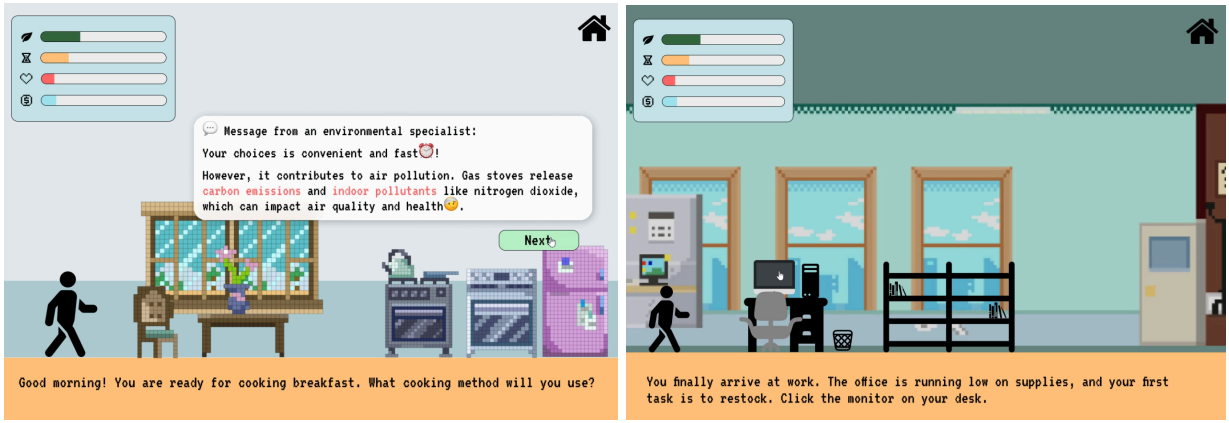

Figure 17. User navigating through the prototype.

Test Participants

Participant	Age	Gender	Occupation	Location	Sustainability Knowledge
User 1	20	Male	College Student	San Diego, CA	Moderate
User 2	21	Female	University Student	San Diego, CA	Moderate
User 3	22	Female	University Student	San Diego, CA	Moderate

Table 6. Participants demographics

Results

	User 1	User 2	User 3	Average

Desirability	4	3.5	3	3.5
Usability	5	4.7	5	4.9
Sustainability	4	2.5	1	2.5
Aesthetics	5	5	4	4.7

Table 7. Testing Results

Does your solution fulfill a meaningful need?

The prototype does fulfill the need for an interactive and engaging way to educate users about air pollution and sustainability by incorporating scenario-based decision-making and immediate feedback. Users responded positively to the aesthetics, the structured decision-making process, and the feedback system, which provided informative explanations of the pros and cons of each choice with short sustainability tips. They mentioned that the game does not have a lecture-like tone, but rather, presents information in an interesting and constructive manner. Another thing that took note of was the combination of multiple-choice scenarios and small interactive puzzles that kept the learning experience immersive. Also, the game encouraged critical thinking by allowing users to reflect on various consequences of their actions, particularly after Stage 1 as they began to incorporate expanded conclusions of their decisions. One participant stated that initially, they made low-impact choices but reconsidered their approach after reading the feedback on consequences, which suggests that the game effectively encourages players to think beyond short-term benefits.

However, even though the prototype successfully portrayed educational value and the complexity of sustainable decisions, users noted that making high-impact choices often felt unrealistic or inaccessible due to constraints (e.g. financial stability). This user feedback indicates that in order to raise awareness through the game, we need more realistic, achievable solutions within the game that align with real-world limitations.

To what extent is it safe, easy, and intuitive to access and use?

Overall users found the prototype intuitive and easy to navigate with an average usability rating of 4.9 out of 5. Participants described the interface as visually appealing with a smooth flow, and the text formatting such as sectioning and emojis helped maintain engagement. No serious usability issues were reported, which we can consider that the game structure successfully guides users through the experience. One minor error was the grammar inconsistencies, which could affect clarity and readability. Furthermore, another area we could improve on is the overall format, as several multiple-choice options feel restrictive and prevent users to think creatively about sustainability solutions. We can possibly incorporate some

open-ended problems to improve engagement. The prototype is considered safe as it there are no physical or psychological risks, and mostly contains user-friendly visual elements.

What, if any, are the limitations of your procedure and results?

After the user testing process, there are some limitations that we should acknowledge. For example, the small sample size of three participants is significantly limited, and a larger and more diverse group of participants would provide us with more reliable conclusions about the design requirements of the prototype. In addition, because the participants were all college students in the same age range, demographic representation is also limited. Individuals from other age groups and backgrounds may considerably differ in results and levels of knowledge of environmental issues.

Another limitation is potential biases from self-reported feedback. Participants' responses were subjective and may not accurately reflect their actual engagement or learning experiences. Some participants mentioned that the multiple-choice format felt restrictive and repetitive, which limited their ability to express more creative solutions. This constraint may have affected their perception of the game prototype's relevance to real-world decision-making.

4.3 Feasibility & Suitability

Based on our design, we are planning to implement our solution using Construct 3, a platform designed for developing games with ease. With the provided code from Ron Kagan, one of our primary stakeholders, we are able to access the Construct 3 software platform and build our game with their provided features. We will use copyright-free images or credit the sources from which we take images. Because our game design has pretty simple logic, mostly based on choices having different point values and the summation of these points, implementation of our design would only require a few event listeners added to objects or buttons. To explore more of Construct 3 and its alignment with our finalized game design, the developers followed a simple tutorial discussing event listeners in Construct 3. Based on the provided procedure of first adding different sprites, and then specifying events to enable the actions, the developer team concluded that our game logic could be feasibly implemented. The game will simply be delivered through the Construct 3 software platform for end users to interact with. Therefore, the resources required to create, deliver, and use the solution are readily available, making the implementation process incredibly feasible.

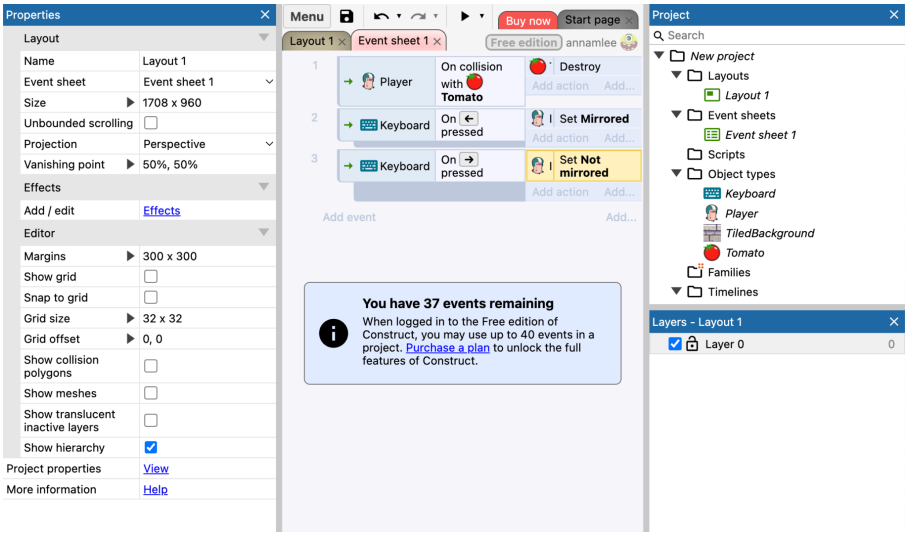

Figure 18. Prototype testing of event listeners on Construct 3.

Other key design requirements aside from desirability, usability, feasibility, and sustainability that our team is aiming to satisfy include having timely visual feedback and a realistic game flow. Timely visual feedback can be evaluated by determining whether or not users see the effects their decisions have on their given budget, carbon footprint, and health before moving on to the next decision level. This can be implemented by having a dynamic progress bar at the top left corner of the screen, showing users their respective budget, carbon footprint, and health levels adjusting to the effects of their decision. During our design process, we ensured the options and decisions presented in the game were reflective of actual everyday dilemmas the average person may face, fulfilling the requirement of having a realistic game flow. We tested the validity of this by asking some of our pre-design survey respondents whether or not the options presented in the game seemed applicable to their daily lives. The majority of those asked responded that the game options seemed realistic. Thus, the solution will perform as expected and be suitable for the context in which it will be used.

4.4 Sustainability

As for the economic sustainability of our solution, our simulation game is designed to be cost-effective to ensure accessibility for a wide audience. Since the Clean Air Challenge is designed using Figma and developed with Construct 3, two browser-based applications and engines that are available for free use, it minimizes infrastructure costs and ensures flexible implementation across multiple digital platforms. Although there is an option to acquire a paid subscription for unlimited features and publishing, a free license version of Construct 3 is available for us to create and test our game. Since there is no additional software purchase required, the cost to implement and maintain the game is low. Moving on, our solution promotes

user financial self-sufficiency by educating players about cost-saving and environmentally-friendly decisions, such as energy-efficient daily appliances, eco-friendly commuting choices, and policy-making that balances economic growth and environmental conservation. Users' financial security is also improved since they can have free access to the game.

When it comes to socio-cultural sustainability, our solution is culturally appropriate and inclusive by including realistic choices that echo various lifestyles and socio-economic backgrounds. All scenarios are designed with challenges that universally occur for users to make personal decisions upon trade-offs based on their values and priorities, which ensures its relevance to diverse community life. Feedback is presented neutrally to objectively encourage users to reflect on their choices with critical thinking. While environmental sustainability is the main focus, we also recognize that personal decisions are usually constrained by personal circumstances such as convenience and lifestyle needs. Users are not penalized for not making the ideally "perfect" choice, but they are encouraged to make achievable and realistic decisions. To ensure community-driven design, we initially conducted user research on environmental behaviors and incorporated feedback from students and sustainability professionals. This ensures that our game truly resonates with real-world concerns and empowers users to take real actions beyond the game. Our solution can be harnessed, replicated, and improved by users since the scope of environmental settings and challenges can be expanded based on user's input and performance after launching the game. We plan to look into users' decision-making strategies to refine our game's framework and point system. Our solution also promotes social justice by encouraging collective responsibility and community-supported changes. Instead of pressuring individual users to promote environmental changes, our game focuses on community-based solutions such as organizing cleanup and collaborative initiatives for policy change. The Clean Air Challenge highlights the importance of both personal responsibility and systematic changes.

5. Design

5.1 Overview

Our team created the Clean Air Challenge simulation game, which places players in everyday life scenarios where they make decisions and demonstrate how their actions affect air pollution levels. While attempting to make this game entertaining, we also aim to educate and increase awareness of the harms that pollution causes to the environment. We incorporated real-world scenarios, including transportation choices, energy consumption management, waste disposal, and more to engage players in a game that reflects real-life situations. This approach not only enhances gameplay motivation but also fosters a deeper understanding of environmental pollution.

Players will receive immediate feedback from the game through a scoring system that evaluates how their decisions affect the environment and their daily lives. To ensure that decisions have meaningful consequences rather than simply being right or wrong, scores are

reflected across numerous factors to help them recognize the impact it has. In order to provide players with a deeper understanding of climate change and how we may improve our environment, this game design encourages critical thinking and trade-off analysis by reflecting real-life decisions.

Figure 19. One of the interactive scenarios in our game with a feedback page.

5.2 Detailed Design

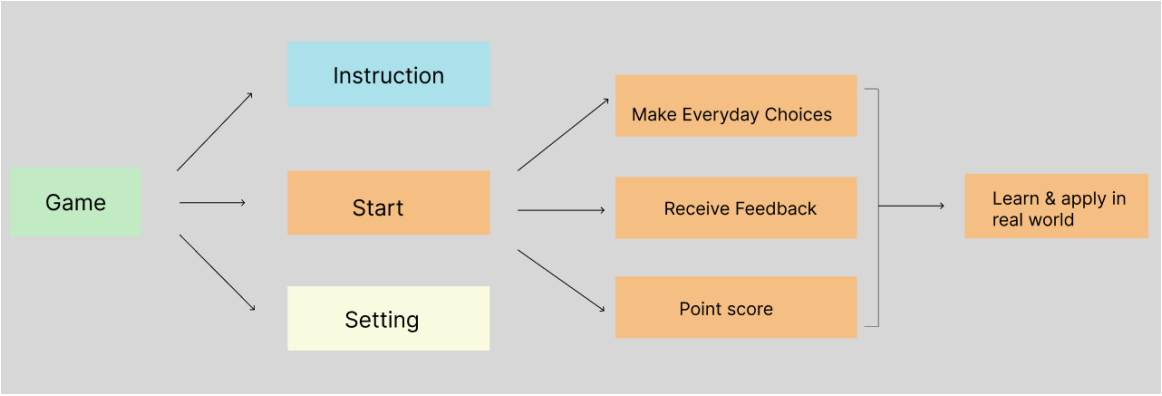

Figure 20. Our design flowchart.

The flowchart above illustrates the structure of our game design, where players can click on to read instructions, start the game, or adjust settings. In order to make it easy for players to comprehend and engage with the game without any confusion, the instruction page provides a clear explanation of how the game runs and what players need to do. The settings page allows players to customize their gameplay preferences for a better experience. Players will engage in real-world decisions, selecting an approach of action in response to daily situations and will receive immediate feedback including suggestions and a breakdown of the decision they choose. Their decision will be evaluated through a scoring system based on four key factors: 1) eco points, representing environmental impact, 2) convenience, reflecting the ease of making a

choice, 3) health, indicating the effects on personal and public health, and 4) budget, accounting for the financial cost of each decision.

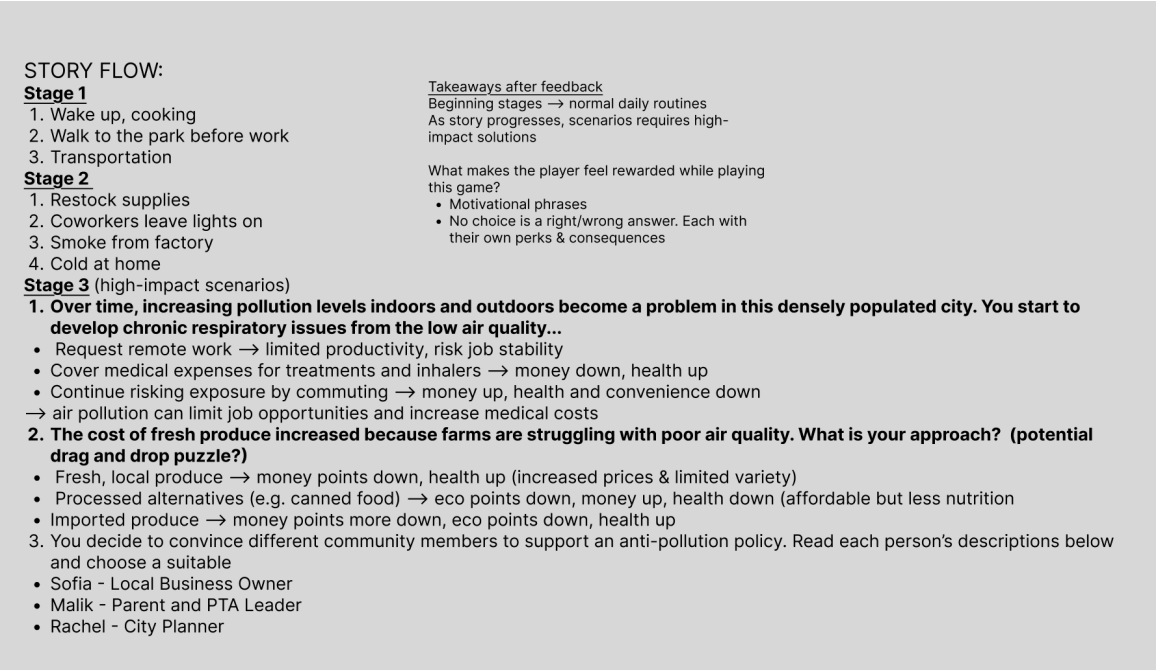

Figure 21. A brainstorming process when we are designing.

The key design features include real-world scenarios that are intended to reflect everyday choices that affect pollution. This game will help players to connect gaming actions to their real-world consequences to enhance awareness of pollution impact and how to reduce pollution. The point system feature, which we ended up with four factors, is meant to demonstrate trade-offs and encourage deeper engagement by requiring consideration of multiple perspectives and recognizing the impacts of their actions changes the environment. This feature also brings players to experience gamification to encourage engagement and make this game a bit more challenging with thinking that players might enjoy.

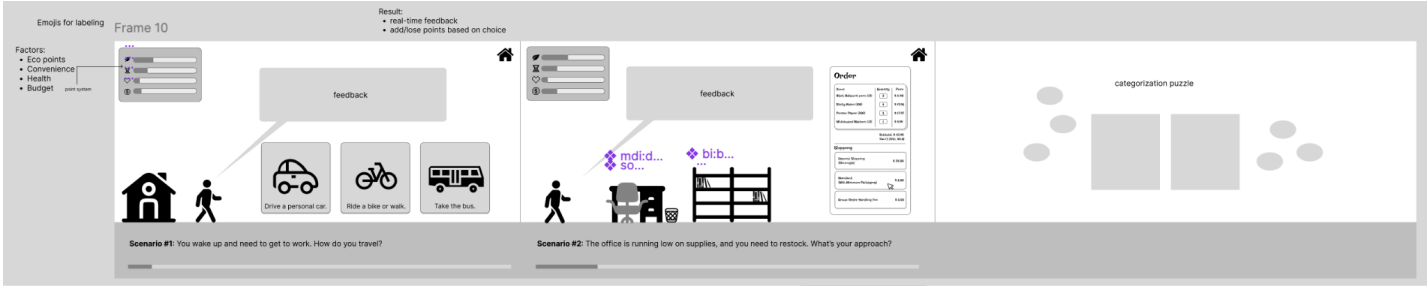

Figure 22. Low-fidelity prototype ideas and progress.

We also implemented a category phase, where players are presented with different pollution causes with their effects that they need to match correctly with their understanding and thinking. This idea is to encourage players to understand the connection of human factors and pollution in the environment. Additionally, at each phase, we also added progress bar updates, showing clear visual feedback on their progress that gives players a sense of how much longer the game will take and how far they are approaching. Story-driven feedback is also incorporated, offering insights that enhance player engagement and learning through narrative elements.

Figure 23. High-fidelity prototype.

Despite these features, the game displays a flow of a daily routine scenario that highlights how an average person's daily routine contributes to pollution. For example, the game begins in a home setting (waking up in the morning), transitions to an outdoor setting (taking a walk in the park), and concludes in a work setting. The layout and game elements including the mission display, scoring system, questions to answer, and feedback, help to maintain an intuitive and engaging gameplay experience. After players have completed all the scenarios in the game, a summary page will also be presented, highlighting the final score on air quality and impact based on the player's decisions. Our team will be using this design idea and will implement it using Construct3 to develop a game that effectively illustrates the impact of daily choices on pollution in an entertaining and educational approach.

Figure 24. Game Summary Report page that reflects players' actions.

Clean Air Challenge Mock-up:
https://www.figma.com/design/gL5wBMKWwP3b7S3ZA0QBFq/Prototype?node-id=0-1&t=zBg4FjqdH1X4KdPM-1

6. Implementation & Impact

6.1 Implementation

We began our implementation process by creating a Construct 3 project folder to house all of our code and uploaded this folder to a GitHub repository. GitHub is a platform that allows developers to create, store, manage, and share code, ensuring seamless collaboration within teams. By utilizing GitHub, the developers on our team can all individually work on different aspects of the project concurrently without conflicts, a feature not inherently provided within Construct 3. This allows the team to work more efficiently given the quarter time constraint.

Full implementation of our design will be accomplished using the Construct 3 platform. Construct 3 is the browser-based game-making software that PlanetFlip, our partnered nonprofit organization, provided our team with access to in order to implement our design feasibly. Developers on the team will build the game screen by screen, adding sprites, objects, and event sheets as necessary, closely following the Figma prototype visuals and logic provided by the designers.

As our final deliverable, we will publish the game employing Construct 3's built-in exportation feature after all the screens are completely built to the team's standard. Construct 3's

publishing feature allows us to export the project to a variety of platforms, including the web, mobile, and desktop apps, allowing us to maximize our breadth of end users.

6.2 Failure Analysis

Failure Mode	Effect(s)	Severity (1-10)	Occurrence (1-10)	Detection (1-10)	Risk Score (S*O*D)	Action
Player does not understand pollution impact	Game failed to educate, pollution not reduced	8	3	3	72	Improve message quality
Player already knows required actions to reduce pollution	Player loses interest in continuing and learning	7	3	3	63	Incorporate lesser known pollution facts
The game has bugs or glitches	Cannot make progress in game, game unplayable	9	1	3	27	Debug and test out game, make consistent updates
The game is lacking engagement features	Players lose interest in continuing and learning	8	3	3	72	Incorporate engaging and interactive challenges

Table 8. Failure Analysis

6.3 Monitoring & Evaluation Plan

The breadth of impact of the Clean Air Challenge is moderate, since it focuses on individual behavior change instead of institutional policy enforcement. Because of its online-based nature, we expect it to maximize accessibility and engagement among users beyond geographical limitations. We intend to reach students, young professionals, and individuals who are environmentally conscious and interested in learning about how to reduce air pollution. Furthermore, we hope to integrate this game into sustainability education programs and environmental non-profit organizations to further educate more people with potential interests.

The Clean Air Challenge is an effective education tool that can be played anytime and anywhere with low learning costs. In terms of depth of impact, it is considered high as it promotes long-term behavioral shifts in how individuals see air pollution and their own potential to make a difference. Some key impacts include decision awareness, critical thinking, and real-world applicability. The game helps players understand how their daily choices affect air pollution at different levels, which encourages them to critically think about realistic trade-offs, such as economic, social, and environmental aspects, instead of being ideal. By incorporating real-life settings into gameplay, we can ensure the generalizability of users' environmental-friendly behaviors in the real world. As a result, players are more likely to choose sustainable transportation, lower daily energy consumption, and support policies to promote cleaner communities.

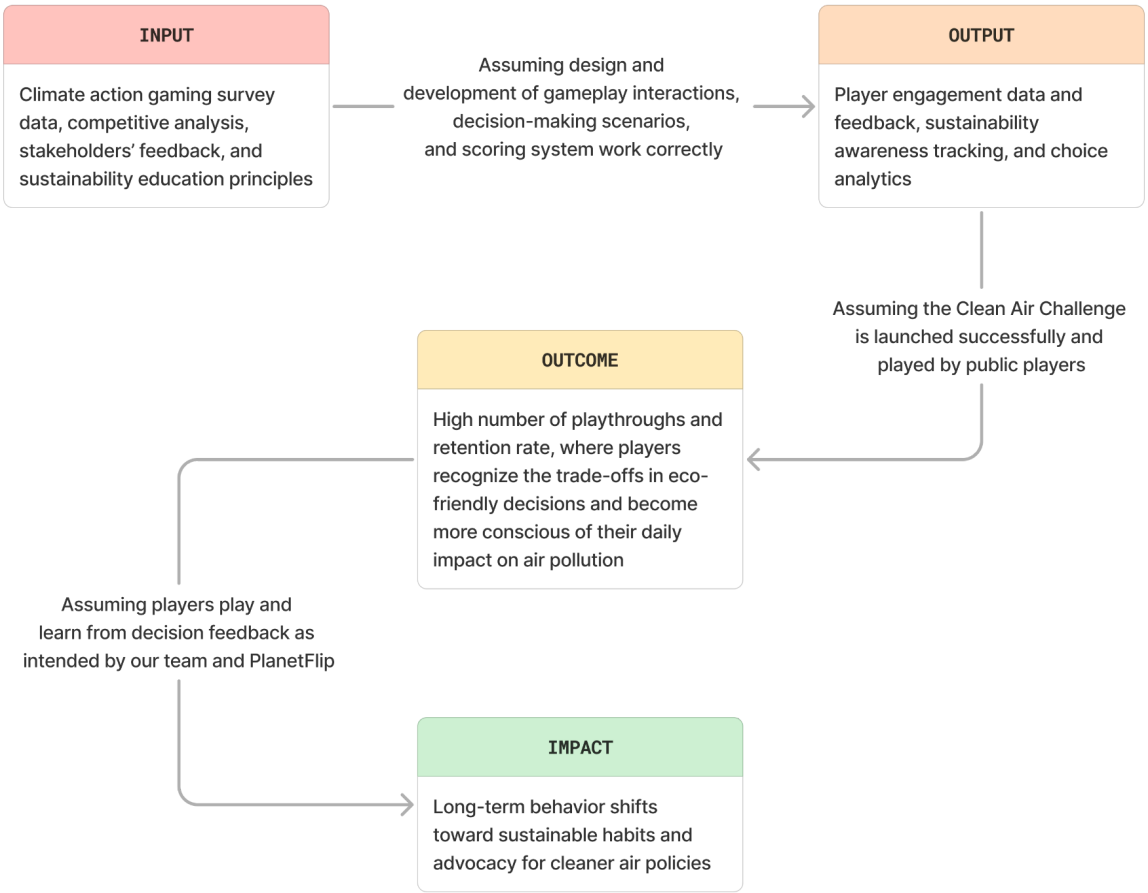

Figure 25. Theory of Change diagram

Indicator	Data Source	Frequency	Baseline	Target	Action
User Engagement	Number of playthroughs	Monthly	0 users before launch	300+ users in 3 months	Design and development teams iterate on gameplay to improve retention
Decision Distribution	Analysis of players' choices	Real-time	No prior data	Balanced decision trends	Designers assess distribution and logic and game scenarios and choices to refine settings
Knowledge Gain	Pre/post-game surveys	Before and after gameplay	0% improvement	> 60% gameplays show better understanding of air pollution and incentives	Designers assess learning outcomes and adjust content
Replayability Rate	Number of repeated sessions	Monthly	No prior data	> 30% players replay at least once	Designers and developers refine 3 stages of game scenarios and work on engagement strategies

Table 9. Monitoring and Evaluation Table

6.4 Ethical Analysis

Our solution, the Clean Air Challenge simulation game, is designed to educate and engage users by placing them in real-world scenarios where they make choices that impact air pollution levels. By integrating decision-making elements with interactive feedback systems, we

hope to help players better understand the effects of their choices and encourage sustainable practices. Individuals who care about the environment and want to learn more about pollution will mostly benefit from the game since it will provide feedback about air pollution and how their daily habits contribute to environmental degradation. Students or anyone who wants to know more about pollution can also utilize the game as an educational tool to spread awareness and promote sustainable practices in a more interactive manner. Also, environmental groups may gain greater public awareness and understanding, which could motivate policy changes and community efforts.

While our solution has the potential to be beneficial, it may also raise some ethical issues. One major issue is the decision-making structure of the game which may contain built-in biases. Some actions are presented as “better” for the environment, but they may not consider various cultural, economic, or regional limitations. Due to certain restrictions, not everyone can afford to adopt energy-efficient solutions, use public transit, or switch to sustainable products. The game needs to offer complex, realistic choices rather than idealized solutions to uphold ethical integrity and inclusivity.

To mitigate ethical concerns, several strategies should be implemented. For example, a more comprehensive understanding of the problem can be produced, such as by implementing a balanced strategy that challenges both personal accountability and systemic solutions. Another approach is to incorporate diverse scenarios that reflect different socio-economic backgrounds, which can enhance player engagement and realism. While the Clean Air Challenges simulation game presents a solution to raise awareness and promote sustainable behaviors, continuous evaluation of its ethical implications is necessary to maximize its benefits.

7. Conclusions & Recommendations

Our team, the Clean Air Challenge Committee, in collaboration with PlanetFlip, designed and developed a video game to raise awareness about air pollution and encourage sustainable behaviors. Developed using Construct 3, and managed via GitHub for collaborations, the game will be published to a variety of platforms, becoming accessible across web, mobile, and desktop apps, ensuring a broad reach and inclusivity.

The focus of our game is to promote long-term behavioral shifts in pollution-oriented issues, for our target audience of students, young professionals, and environmentally conscious individuals. Real-world scenarios in our game aim to foster individual behavioral change by helping users understand the consequences of their daily choices on air pollution. Hopefully we will see users carefully and considerately think about realistic trade-offs in the economic, social, and environmental aspects in their lives.

While our game has the potential to positively impact the lives of others, it still falls short when faced with certain challenges. One such challenge is ethical problems. Because not everyone within our user base has gone through the same environment in life, there will be biases that will be brought up when given certain choices in the game. These biases in

decision-making will require us to continuously evaluate user responses to the game in order to incorporate inclusivity. We should aim towards adding more diverse scenarios and possibly add storylines with different individual environments that can affect the choices in a balanced manner. For example, if you are unable to afford bus tickets over an extended period of time while owning a hand-me-down car in real life, you should not feel overly penalized for selecting the car in the game due to biases shaped by your environment. Additionally, evaluating user evaluations and game choices will help us refine the game over time. We can assess whether certain scenarios are too easy or too difficult, if our pollution facts are too mainstream, or if our game fails to effectively educate the players. If we ever encounter those issues, we plan on updating our game with more balanced levels, more lesser-known pollution facts, and a better quality of our overarching message. Overall, we plan on adjusting our game as we see fit. Future works should see an improvement in scenario complexity and diversity.

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Appendix

Weekly Meetings every Monday at 6 PM
Summary: The team meets every Monday at 6 PM to review progress, discuss any challenges, and plan the next steps. During these meetings, feedback from testing is addressed and iterative improvements are made to the design and development progress. Key discussion points include refining scenario complexity, improving UI responsiveness, and ensuring a balanced gameplay experience.

Design Phase - 2/21/25
Summary: The designer focused on creating wireframes for the user interface and conceptualizing various in-game scenarios. The wireframes helped visualize the game's structure, including player interactions, scenario layouts, and features. The team also brainstormed potential gameplay mechanics to enhance engagement and realism.

Development Phase - 3/1/25
Summary: The developer started implementing the refined designs into Construct 3. The phase involved setting up the game's core mechanics, UI elements, and scenario interactions using the high-fidelity prototype that our designer has come up with.

Usability Testing with College Students - 3/9/25
Summary: We conducted user testing with three college students through Discord. We sent the link to a high-fidelity playable prototype. Each player played through the game while providing real-time feedback and we recorded their responses based on key design requirements such as desirability, usability, sustainability impact, and aesthetics. We achieved high ratings on usability and aesthetics, while ratings for sustainability impact were on the lower end.

Team Schedule Gantt Chart
Eng 100D 100D Team B Gantt Chart

Climate Action Gaming survey at early research phase
https://forms.gle/sst8i2okNkBY4ZrYA

Climate Action Gaming survey responses
Climate Action Gaming (Responses)

Figma High-Fidelity Prototypes
https://www.figma.com/proto/gL5wBMKWwP3b7S3ZA0QBFq/Prototype?page-id=0%3A1&node-id=69-5&viewport=-953%2C-1087%2C0.08&t=bn7QAyrb0xdZCiZ9-1&scaling=contain&content-scaling=fixed&starting-point-node-id=69%3A5&show-proto-sidebar=1