SUSCOPETY

Design Educational Games

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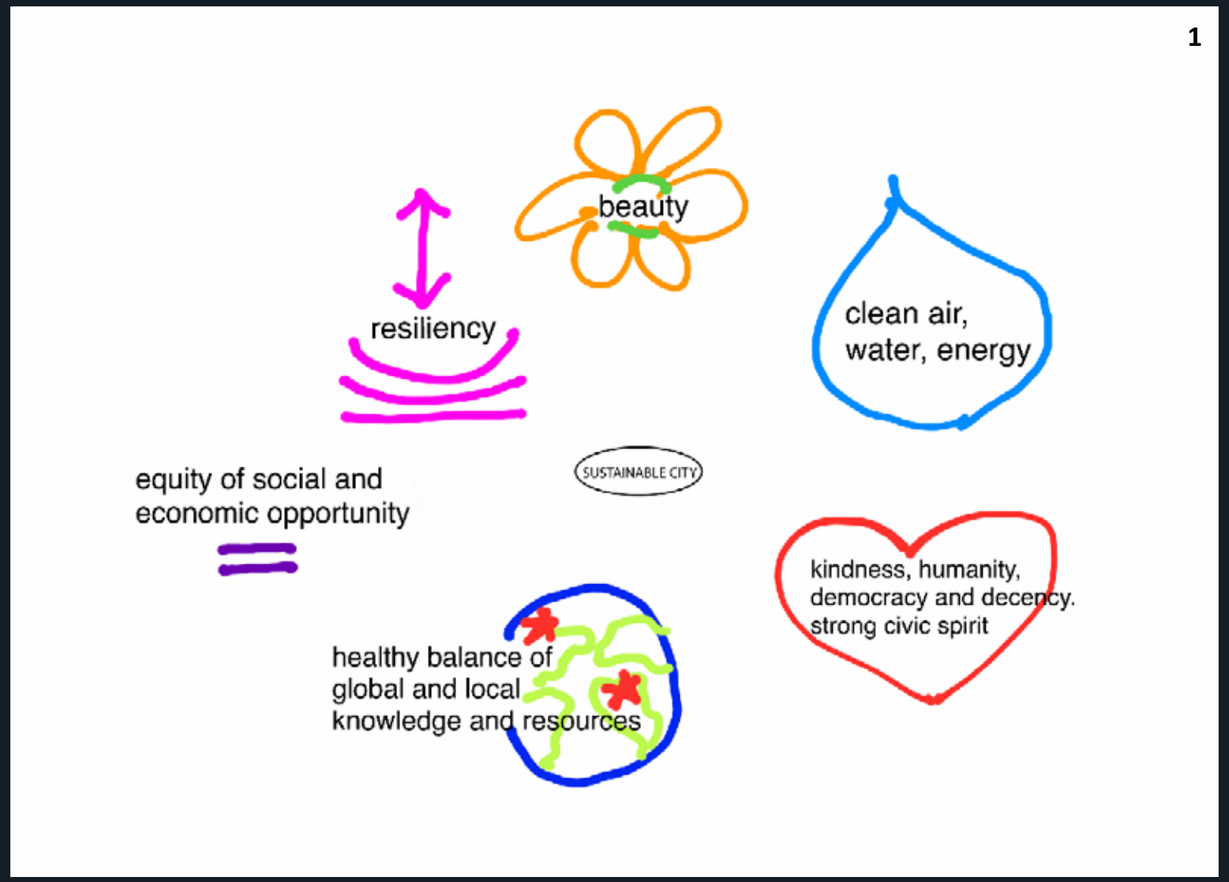
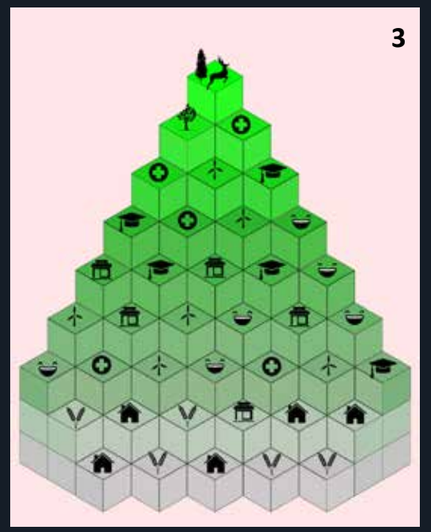
Sustainability has continuously been a heated topic in the recent years--to give it a clear definition, it is the ability to meet present needs with long-term consideration for future generations. It is mostly divided into 3 main categories: **environmental, social, and economic**. In this project, we worked as a team of 3 to design an educational board game with the central objective of teaching young adults (especially middle and high school students) about **sustainable urban design**. Specifically, they will be learning what elements contribute to the city's sustainability and what are some sustainable vs. unsustainable practices. Since sustainability is really ubiquitous in everyone's life, we believe that this game will let them understand the imperativeness of achieving sustainability in the city scale, as well as learn to apply sustainable practices in real-world situations.

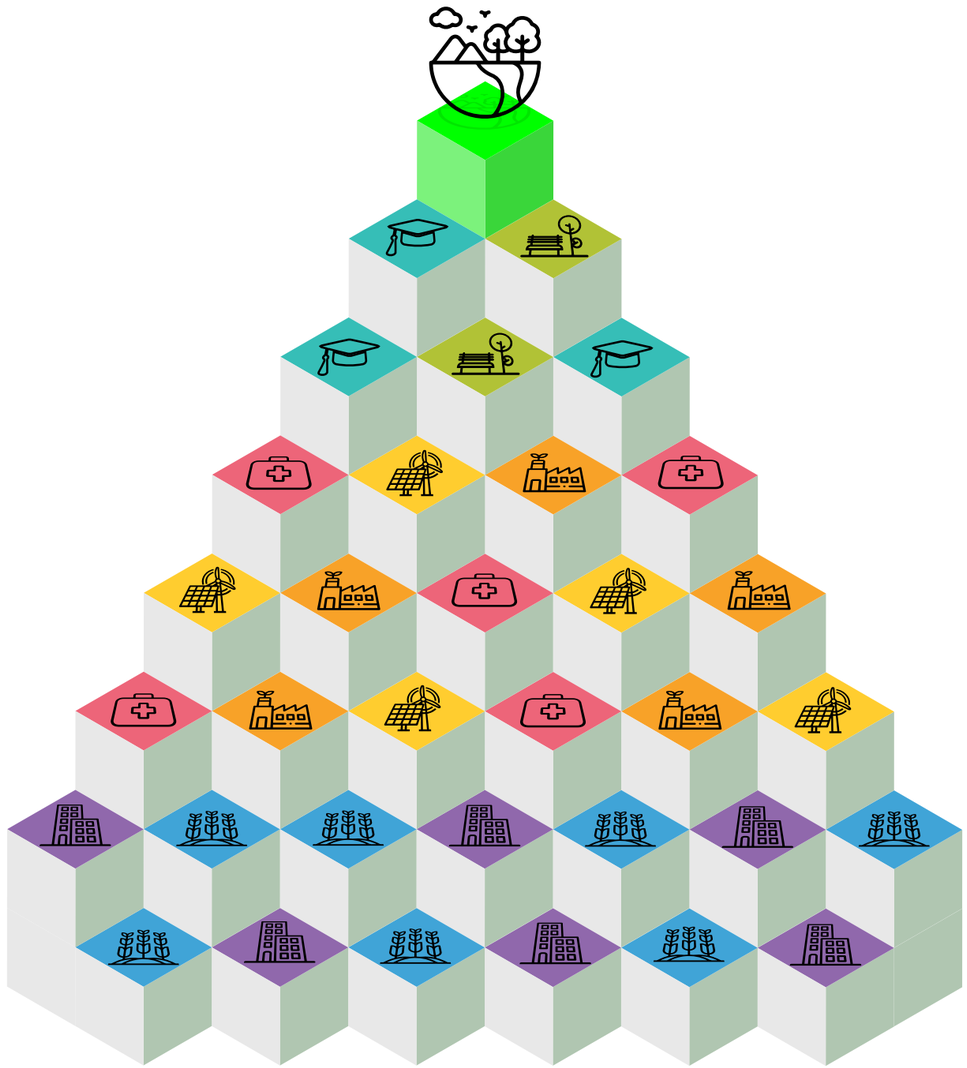
I. IDEATION

Focusing on our topic of sustainability, our ideation process has undergone many brainstorming and prototyping through table top simulator as well as hand sketches. In order to have a better grasp over the subject matter, we also invited three professionals in the field of urban planning, sustainable design, and architecture to run us through some critical elements they believe a sustainable city shoud include. Those interviews let us understand that to achieve sustainability in a city scale, many fields should work in synergy and contribute to the solution. Therefore, we decided that there should be seven categories in the game that represent seven fields in the city that can together achieve sustainability in the city scale--they are: **accommodation, agriculture, energy, industry, health, education, and public amenities**. After deciding the categories, we discussed how players could learn about sustainable practices in each field and how all those combined will contribute to sustainability at the city level. Thus, we thought we'd make a rule that enforces this rule: a player can only win when he/she has developed at least one of each category. Because we are also trying to simulate how a city actually functions in an abstract way, we wanted to put in the idea of resources in our game that are used by players to build infrastructures or development cards. In this case, we settled the resources to **labor, money, technology, and natural resources** as it represents four main sources in city development. All those core mechanisms are designed to serve the core learning goal of introducing sustainable practices and sustainability should be achieved by many fields working together. From here, the main components of the game are decided and are inherited in the later prototypes that we made.





1. Example Expert Feedback
2. Iteration 1--City Development, inspired by *Catan*
3. Iteration 2--pyramidal map, leading to final prototype



Accommodation Agriculture Energy Health Industry Education Infrastructure

II. GAME MECHANICS

1. Game Board

One of our most important game components is the pyramidal game board--comprised of 34 cubes with three distintive layers that encompasses all seven categories (colorcoded) of a sustainable city: Accommodation, Agriculture, Energy, Health, Industry, Education, and Infrastructure. The goal of the player is to design a path that starts at the bottom and goes through **each category at least once** before reaching the "sustainability" icon at the top.

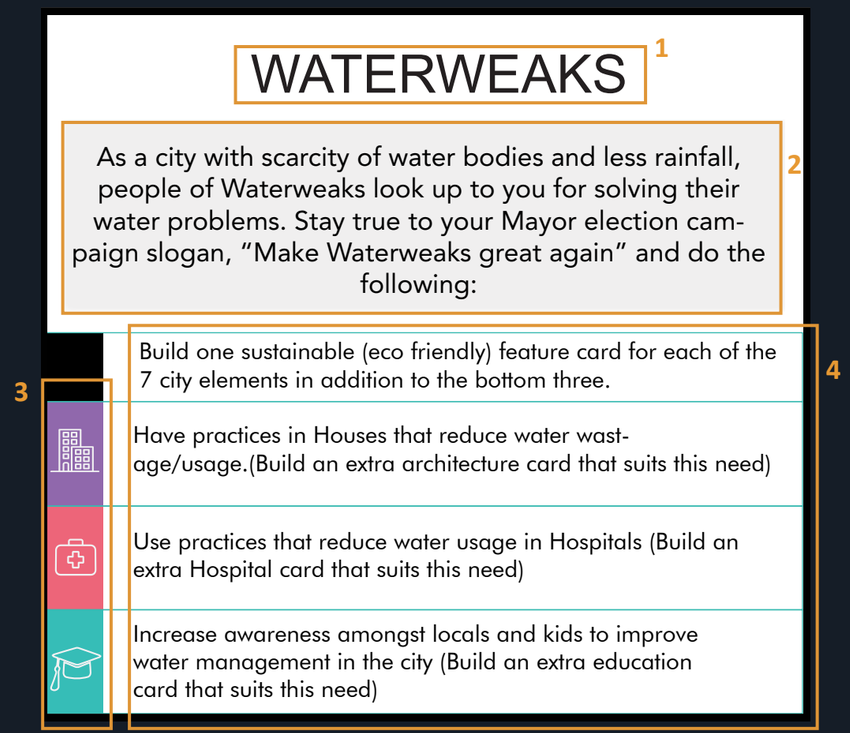
Rule #1. Players can only move across **neighboring cubes** at a time, forward, backward, or horizontal.

Rule #2. Players can only move forward when they have the necessary **resources** (described later) on hand (and are not forbidden by other rules).

Rule #3. Players have different winning requirements based on their **character cards** (described later), which means the basic requirement (collecting all seven categories once) is typically not enough.

Why Educational?

A clear message we intend to convey to our players is that sustainability nearly applies to every aspect of a city. Players should learn that sustainability means to **maintain a balanced, healthy development across all sectors**, and therefore they have to ensure that every city component has gained at least one sustainable feature. Plus, the relative location and composition of each category also reflects their role in our society--for instance, agriculture or energy usually form the foundation of our society, while education tends to be a higher goal/objective of achieving sustainability.



1. Name of the City 2. Background Story

3. Target Categories 4. Requirements & Hints

Why Educational?

We initially thought the game would stand alone without the character cards. But they add another layer to the learning process because now players have to pay attention to specific cards that meet their goals (have to devote more effort reading and understanding). The idea is that whenever they encounter a real-world situation, they would be able to **apply what they've learned from this game** to that situation. The idea of the four resources (and allowing players to communicate and negotiate) is to admonish the players that there is always **limited resources** in the real world, and that's why trading, specialization and sustainability are important.

II. GAME MECHANICS

2. Character Card

The character cards play a special role in our game in that it helps to give players different focuses while acquiring their sustainability features (in other words, they need to focus on one or more categories than the others). A character card describes an imaginary city with some unsustainable features (e.g. too much waste / pollution), which all cities in the real world typically have, and the players' role is to **make their city sustainable** by earning the corresponding sustainable features (hinted by the character cards).

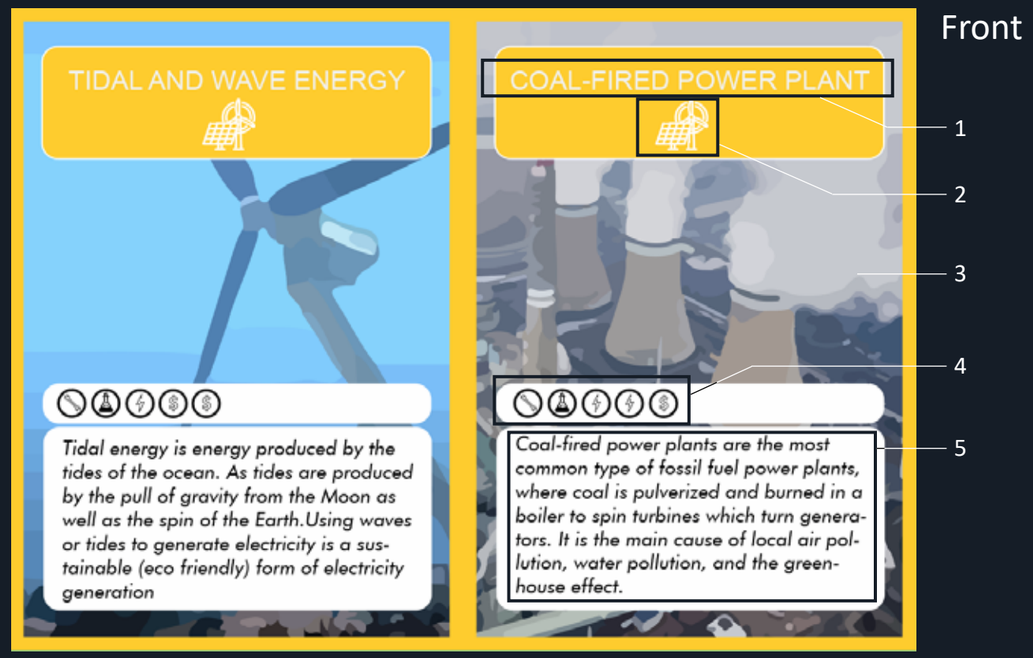
3. Resource Token

The four basic resources of our game are money, labor, natural resource, and technology. They are used as **semi-permanent tokens**, which means earning development cards does not consume resources (they only need to reach the correct amount). The idea is to let players learn to **manage their resources with their maximal potential**.

Rule #4. Throughout the game, players only have **5 resource tokens** on hand (except those earned from development cards).

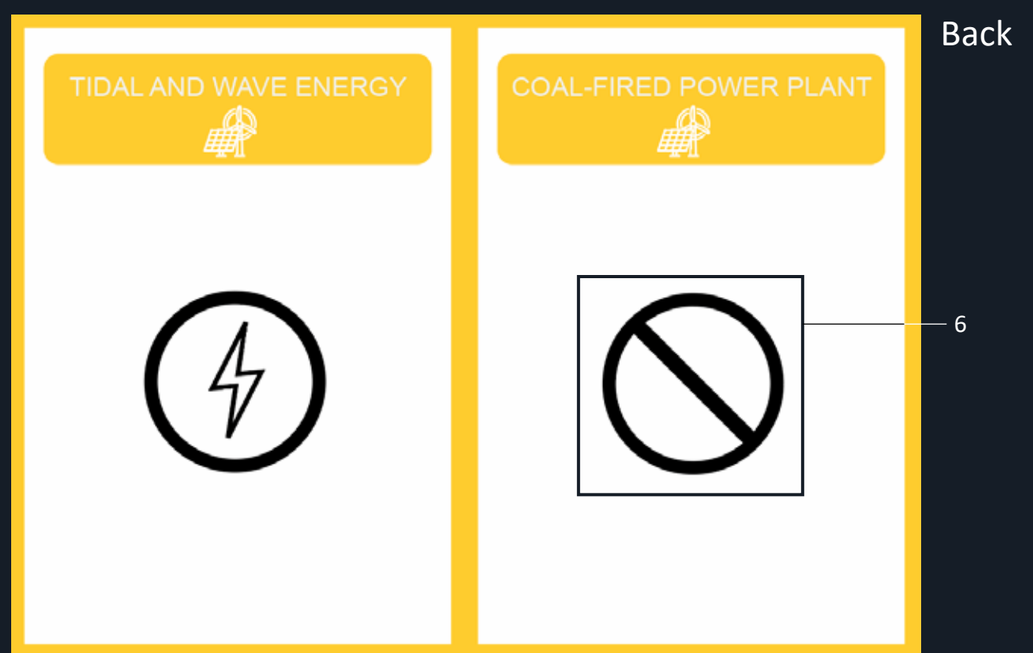
Rule #5. Every turn, players can **exchange 1 resource** with the bank or other players (through free negotiation). If they choose to do so, they cannot acquire **development cards** (described later) that turn.

Money Labor Natural Resource Technology



Example of Sustainable Card

Example of Unsustainable Card



II. GAME MECHANICS

4. Development Card

There are seven categories of development cards, each corresponding to one sustainability sector, but not all development cards are "good". Most development cards describe **practices or technologies** that improve your city's status quo and therefore are sustainable cards, but still a significant number of them are unsustainable cards, meaning that these practices would **induce negative consequences in the long term**. As a result, players need to distinguish between them (by reading descriptions carefully)--they could be rewarded or punished based on their decisions.

Rule #6. Throughout the game, players are always presented with **5 development cards**. They can be **purchased** (by matching with their resource tokens) or **traded** with the bank or other players, one at a time. The development cards get replenished whenever there is a vacancy.

Rule #7. A sustainable card can move players forward one layer (and might earn them an extra resource), while an unsustainable card can force them to skip one round. Players **cannot flip the cards** until they earn them, and therefore have to infer whether the card is sustainable or not.

Why Educational?

Our previous version did not include unsustainable cards. But we learnt from our playtest sessions that players would not spend a lot of time reading and learning from the cards. Mixing sustainable and unsustainable cards will force players to **pay attention to the card content** because that is the only way they can distinguish between them.

1. Name of the Card/Feature 2. Category 3. Descriptive Picture
4. Required Resources 5. Detailed Descriptions (strongly recommended to read)
6. Result of the Card (Empty, Gain 1 Resource, Skip 1 Round)

We conducted playtest sessions with 5 paricipants aged 19 to 22, and each session lasted for about 40-75 minutes. We found out that in general, participants expressed **fun, confidence, and surprise** during the game and very little frustration or confusion. After the game, most found themselves to have **an increased knowledge of sustainable practices** as well as the many categories that contribute to urban sustainability. Here is some feedback quotes from our participants:

"I really like that there's a lot of richness and different layers of learning in the game. I wonder if students will understand all of it."

"The storyline is great. Apart from the initial learning curve the game is fun."

III. SYNTHESIS & EVALUTATION

What are the learning principles involved?

Scaffolding

- Divide learning into modules with increasing expectations
- The map is divided into three layers with more difficulty towards the top, so that players are encouraged to focus on their current layer without getting overwhelmed by all seven piles

Guided Attention

- Provide explicit instructions of what they should focus on
- Character cards provide hints (but do not say directly) for what extra cards they have to acquire

Spatial Contiguity

- Present texts and images in close proximity to one another
- Development cards have pictures and detailed descriptions on the front that help players learn

Immediate Feedback

- Providing timely feedback (right after a move) has the most learning effect
- Players can immediately flip to the back after they purchase a development card, which will tell