



Figure 1: After a massive cataclysm that destroyed much of the island, Junker (player character) travels through The Sunken City in search of survivors. Above, basic on-screen inventory and character POV are shown. Green circle in lower-left corner represents a movement switch that provides visual pulse feedback when activated. If pressed and held, player will move in the direction pulled. Alternately, movement may feel more natural with a press-and-click AI method, for which the player would simply move to the location tapped (as shown later in puzzle levels). While the current digital game prototype has tank-based movement control, a mobile version will move primarily with swiping motions.

“JUNKER & THE SUNKEN CITY”

A zero-combat survival and adventure RPG about material science and the power of recycling, reusing, and reducing

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Introduction & Game Concept

Junker & The Sunken City is a role-playing, adventure, and survival game for mobile devices in which the (player) character must learn to *recycle*, *reuse*, and *reduce* in order to safeguard his home town from a series of natural disasters. The game possesses fantasy and sci-fi elements, but is essentially a naturalistic representation of scientific principles¹. As a simulation, the game takes on the role of a natural disaster scenario, in which the player character—a member of an urban island community—must apply material science principles to solve a diverse range of problems (social, mechanical, medical, etc.), with the ultimate goal of repairing and restoring Twin Oak City, which has been largely ignored and whose people have been left to fend for themselves by national governments.¹ In the process of completing this



Figure 3, Design mock-up of prototype object material classes. As the player character progresses in levels, additional material classes are discovered: paper, plastic, etc.

mission, the player character enters many different environments, each requiring their own attire (scuba suit, gas mask, etc.) which must be acquired and equipped. In its mini-games (describes herein), the game also touches upon topics in mechanics, physics, biology, and chemistry – although the game’s primary interest is material science.

In *Junker & The Sunken City*, the player takes on the role of the **Junker**, a character who starts our story as a line cook at a greasy spoon near the Twin Oak City Airport. The prologue follows the player as they lose their job and are given a new one as a Junker (many NPCs will simply call the player “Junker,” while others will call them by the player’s chosen character name. When a natural disaster hits and the entire island goes under water, Junker takes on the role of a city protector, freeing families from captivity, rebuilding power lines, and navigating natural and urban environments to help get the water

¹ This project simulates the fallout of a natural disaster, a subject on which I have performed comprehensive and first-hand research (focusing on Hurricanes Katrina and Maria). The game world should possess locations evocative of tourist destinations that have been destroyed by tropical storms.

out of Twin Oak City. To do so, the city needs its pumps working, and that means the water filtration, energy production, and waste renewal plants will all have to be up and running. Many of the city's best scientists have left for greener pastures and have abandoned their lives (and notes) behind. With these, the player can piece together the power grid and help restore balance to the sunken city and her citizens. In following with Henry Jenkins' concept of environmental storytelling,¹¹ my goal is for the player world to be fully immersive and with spaces that are evocative not only of natural and urban landscapes, but of spaces that haven't quite found peace with either status—reflecting the game's intention to stimulate player thinking around the individual and communal use of space.

The player character's primary activity is collecting resources from the environment (identifying them as recyclables or waste items) and later breaking them down into their constituent parts. At the end of each quest, or when the player has reached a breakdown location found in the game world, the player's physical finger swipes are representative of the gathering and distributing motions, as described in later sections here.

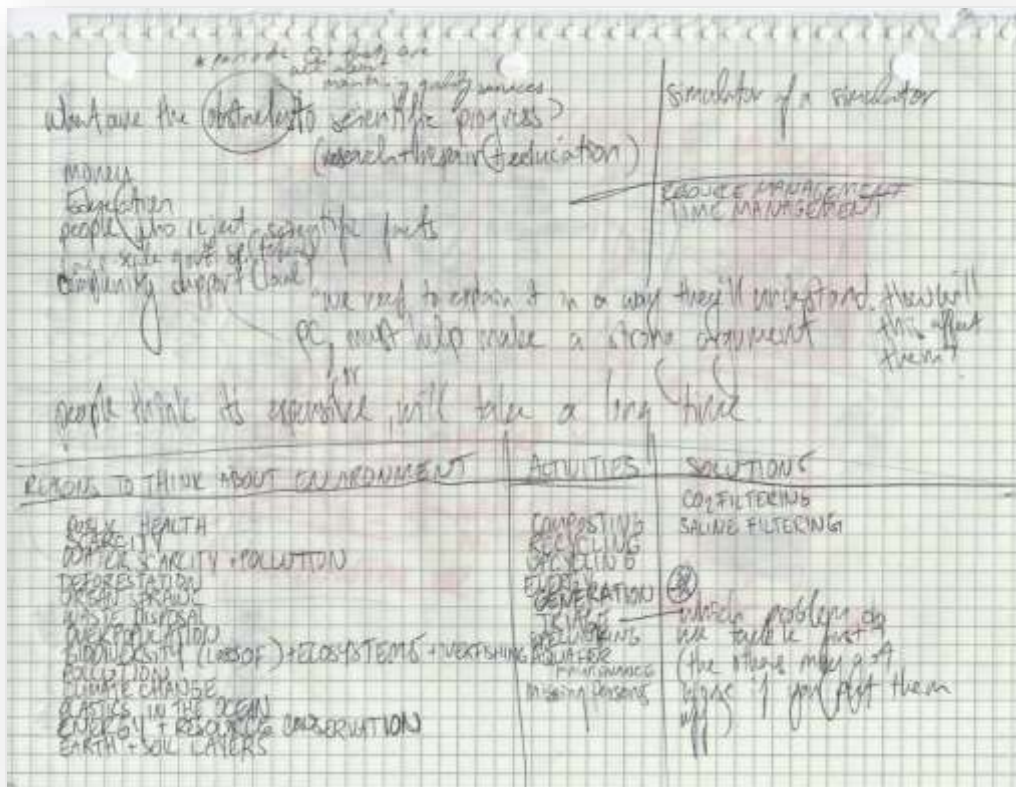


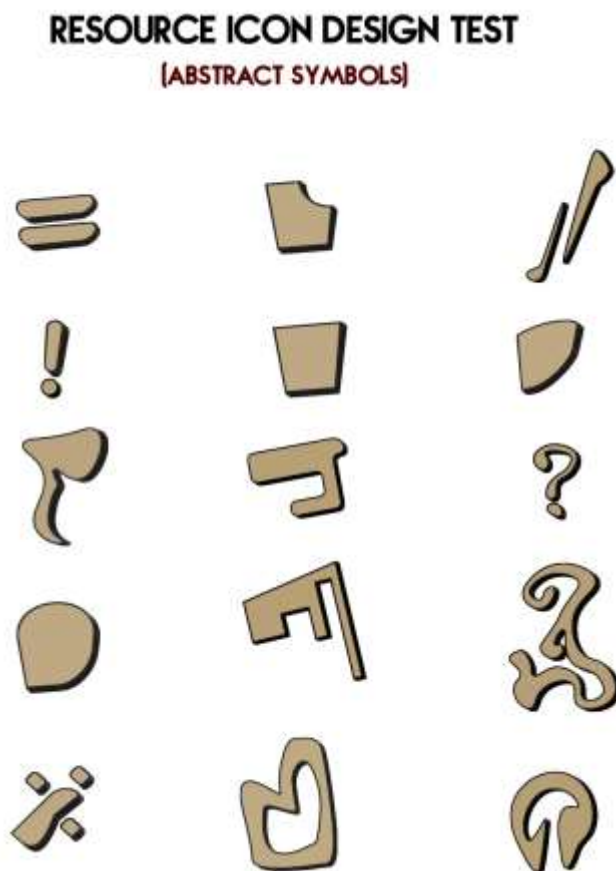
Figure 4, Initial discovery and brainstorming list for game concept.

Background

Target Audience

The proposed simulation game serves reading-age children, youth, and adults, aiming to provide them with frameworks for clear, actionable, and environmentally responsible material use behaviors and activities. We can teach recycling, reuse, and resource reduction at every academic level, so my hope is to create a game whose content is realistic and valuable for both children and adults; I place this in the backdrop of world adventuring games like *Pokémon Go*, *Minecraft*, and *Legend of Zelda*, which appeal to players from a massive range of user demographics and ages.ⁱⁱⁱ

Figure 5, Icon Prototypes



Learning Objectives & Content Description

Players are expected, by the game’s completion, to understand where and how to recycle and reuse basic everyday objects and materials, such as printer paper, glass bottles, or soup cans. Specifically, players should understand how paper, plastic, metal, glass, and organic materials are properly disposed of, broken down, and reused. Players are also expected to develop higher-level social, conceptual, and visualization skills, consistent with Gee’s theories on learning and knowledge application in virtual worlds (Gee, 2008).^{iv} In *Junker & The Sunken City*, players will learn what materials can be recycled; how to recycle each of these material categories; and how material reuse can affect the environment. To clarify and narrow the game’s scope, I am limiting its material categories to paper, plastic, glass, metal, and organics—allowing more advanced players to continue narrative gameplay and explore more advanced material combinations in later levels.

Market Analysis

There are several popular physical recycling games for kids, and many touch screen games that apply environmental science themes. However, there are no current competitor games that appear to provide a similar educational model. Most recycling games appear to be puzzle-based, rather than adventure- or character-based. And among the most widely used interactive simulations focusing on recycling—or at least those that can be considered potential *competing solutions*—the majority take the form of helper and self-help mobile apps, such as *Recycle Coach*. But there are many examples of games that serve an almost identical socio-cultural purpose—to encourage respect of the environment, limiting of resource spending, and reattributing of spent resources, and to commit to long-



Figure 6, *Recycle City* (web & mobile), EPA Online

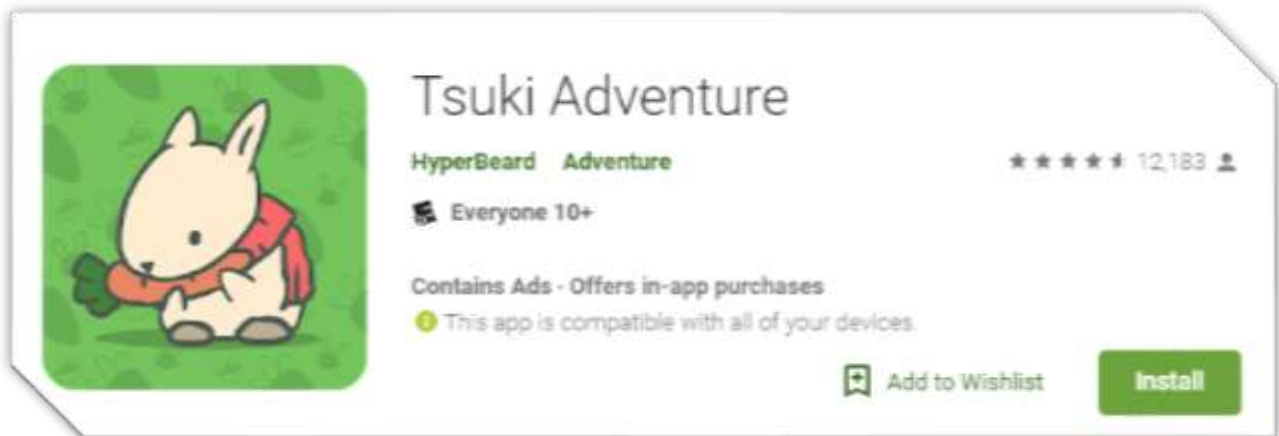
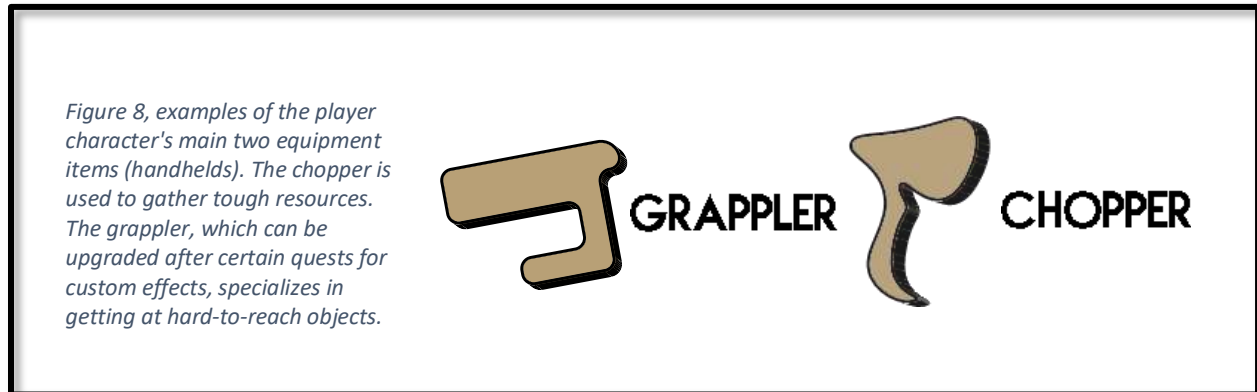


Figure 7, Download page for *Tsuki Adventure* (Android)

term thinking and planning strategies when approaching the natural world. *Tsuki Adventure*,^v an adventure and puzzle game for iOS and Android, offers perhaps the most similar world design, character role (“town helper hero”), and social interaction design to my game, but does not have clear educational goals (in other words, it is not a competing solution). *Stardew Valley*, a narrative adventure farming simulator, provides a clear comparison in terms of the player character’s narrative interactive possibilities, resource management requirements, and most especially learning goals. But like *Minecraft*, *Stardew Valley* was not created to be a resource management and worldbuilding simulator. Similarly, I feel this is the most appropriate and useful tactic for learning games to find audiences—a topic of which I have performed wider research for other courses. *Recycle City*,^{vi} a press-and-click narrative game, provides an excellent example of an interactive recycling lesson offered by the Environmental Protection Agency both online and on mobile platforms. While the game also allows the player to explore a city and meet other characters, its press-and-click format does not achieve the same level of interactivity or engagement; in *Recycle City*, the primary mechanic is to press objects in the world and read descriptions of them. In this way, it is less a game than it is a simulation of a city in which the player is allowed limited interaction and basic inferential abilities from the environment. In this example, there is no goal, but instead a

consistent earth-friendly theme that seeks to instill a cultural and social value, while supporting this value with applicable data on material qualities, uses, and reuses.

Design



The Diary of a Junker

The game's narrative can be considered the diary of a "Junker," an occupation that blends repair specialist, mechanic, inventor, and waste disposal expert in a not-too-different world than ours. Many people treat Junkers like second-class citizens. The protagonist may have characterizing visual traits, such as work clothes, gloves, goggles, a tool case, and so on. The Junker travels wielding two main gathering tools—the grapppler and the chopper (described above). The game's characters should have clear, friendly appearances (see character sketch examples under *Visual Design*), matching the low-poly, gentle background and environment style.

Game Assets & Scripting

I created several scripts for this game prototype, including a night/day lighting transition (shown in subway level images), character movement and interaction systems, a basic pick-up and inventory system, and a moving and spinning platforms script. I also built dozens of custom game assets for this project, aiming to flesh out a realistic world at least theoretically. These included floating platforms, rain and water effects, platforms, buildings, and bridges. Player may enter buildings, swim, climb rocky outcroppings, or traverse through dark and dangerous caverns, and in each of these environments, the player is required to be wearing appropriate attire. When the player encounters one of these locations and is unable to continue, game will provide written feedback: "You do not possess the appropriate attire for this location." But the game will not provide information on *what* the appropriate attire is, hoping to help the player think and act more creatively.

Rules

The game has three main rules: (1) when you misplace a resource for breakdown, it disappears; (2) if the player loses all health or O₂, he returns to the laboratory and must relinquish recently collected resources and currency; (3) the player character must survive.

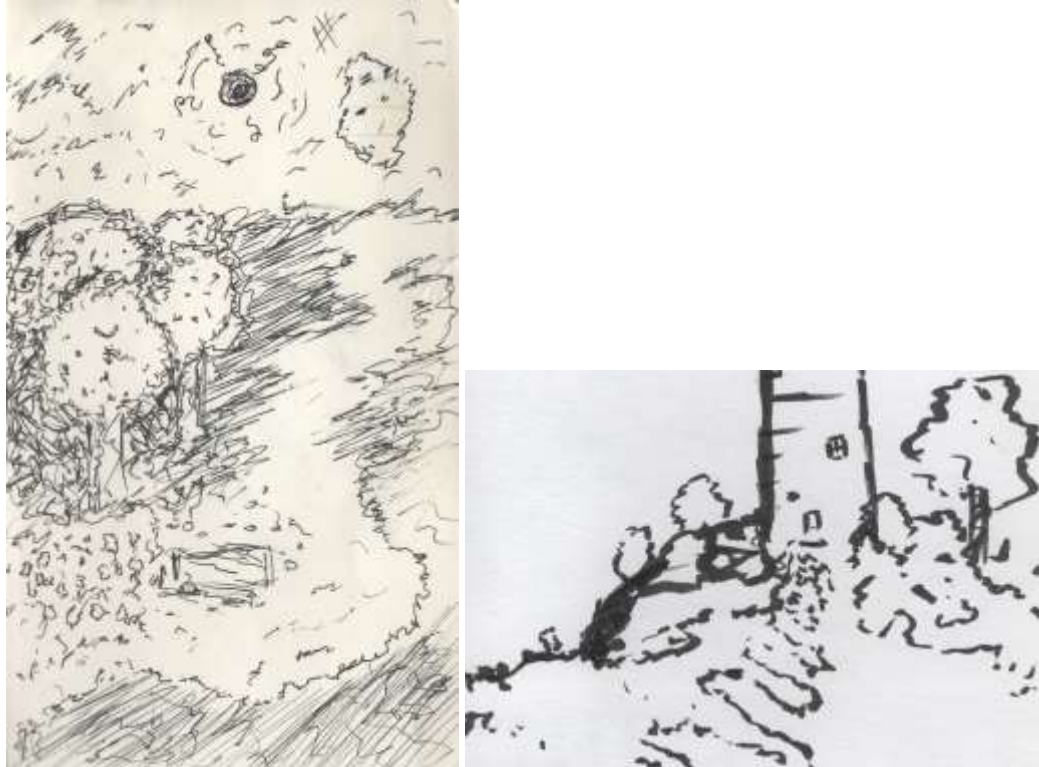


Figure 9, Initial landscape sketches

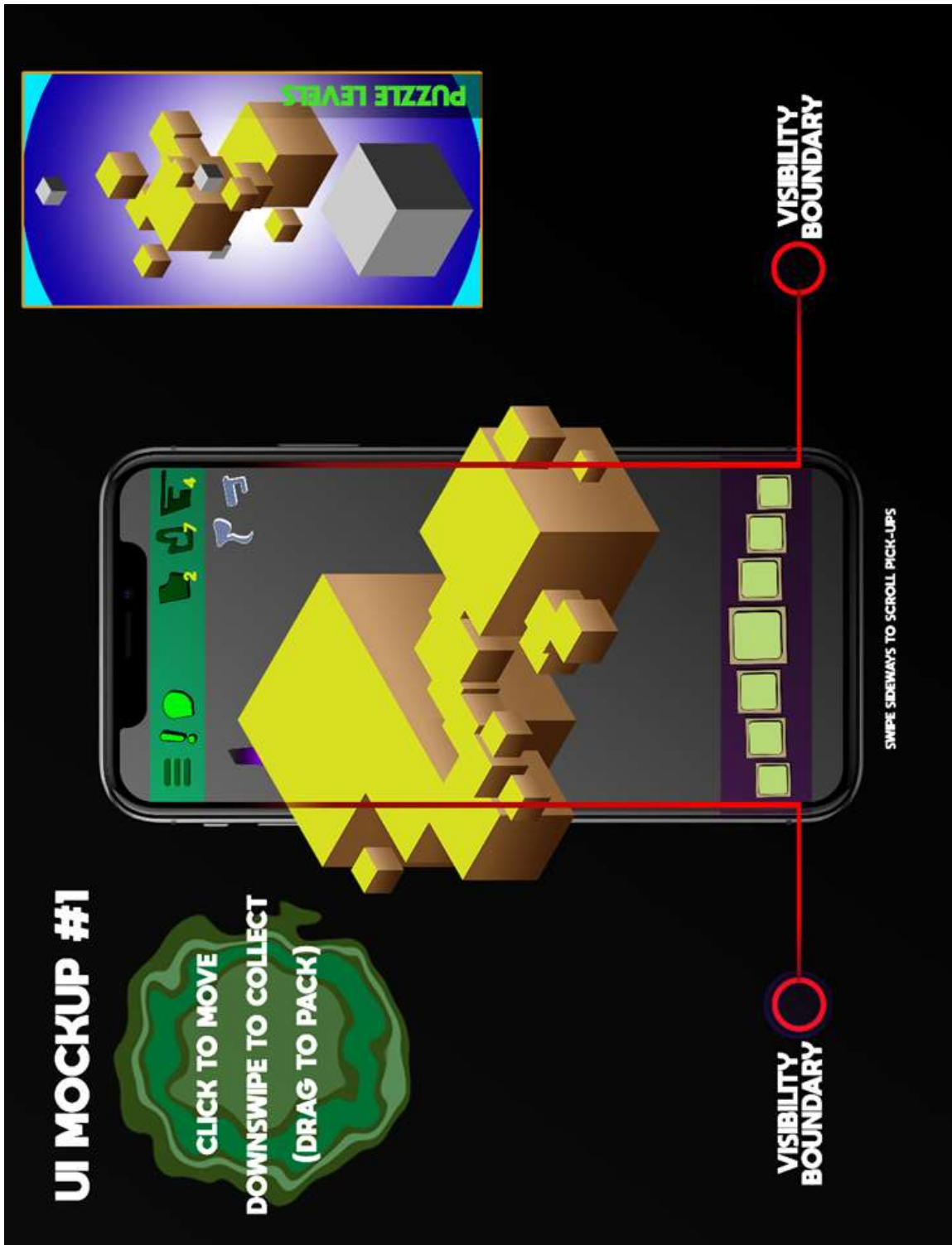


Figure 10, Central UI mockup for a puzzle level, which requires the player to use different movement controls for a timed skills test.

Visual Design

As shown in above examples, JTSS is a 3D, semi-isometric game for mobile devices. The game’s visual design is intended to draw in users of the 6+ age range, and like many Nintendo games, is intended to also be attractive to adults. The game should be one that parents and children can play together, or—at the very least—together from remote locations.



Figure 11, Endless-Runner Mini-Game Mock-Up

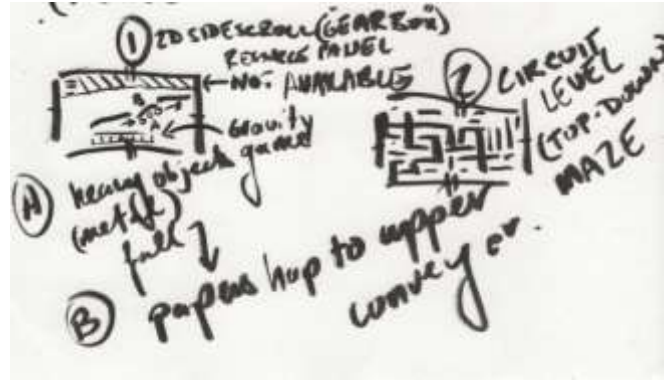


Figure 12 Design Mock-Up for Puzzle Levels

During several quests, the player enters a 2D or alternate 3D environment to complete a particular puzzle or challenge, pulling the player from his comfort zone and encouraging flexibility in thinking and play approach.

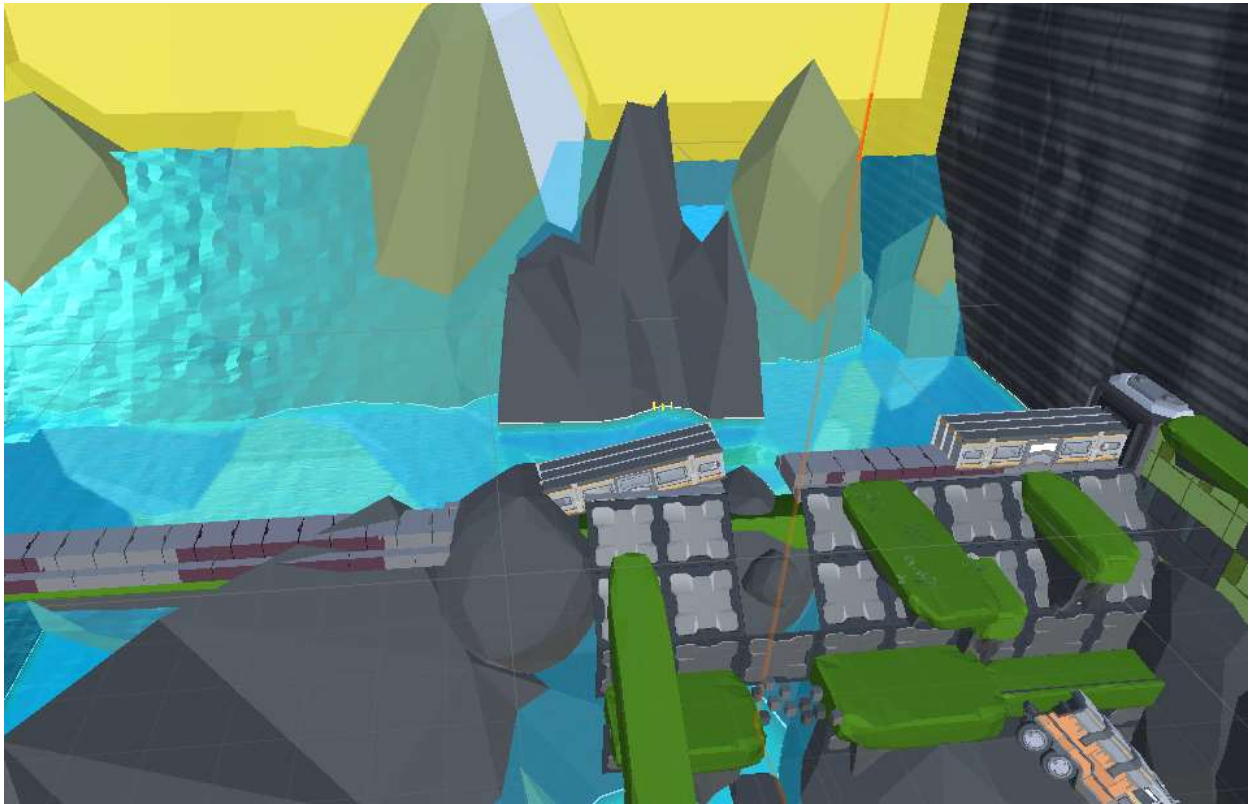


Figure 13, Flooded Subway Quest: Player must enter a flooded subway system and open a drain that will free passengers and lower water level.

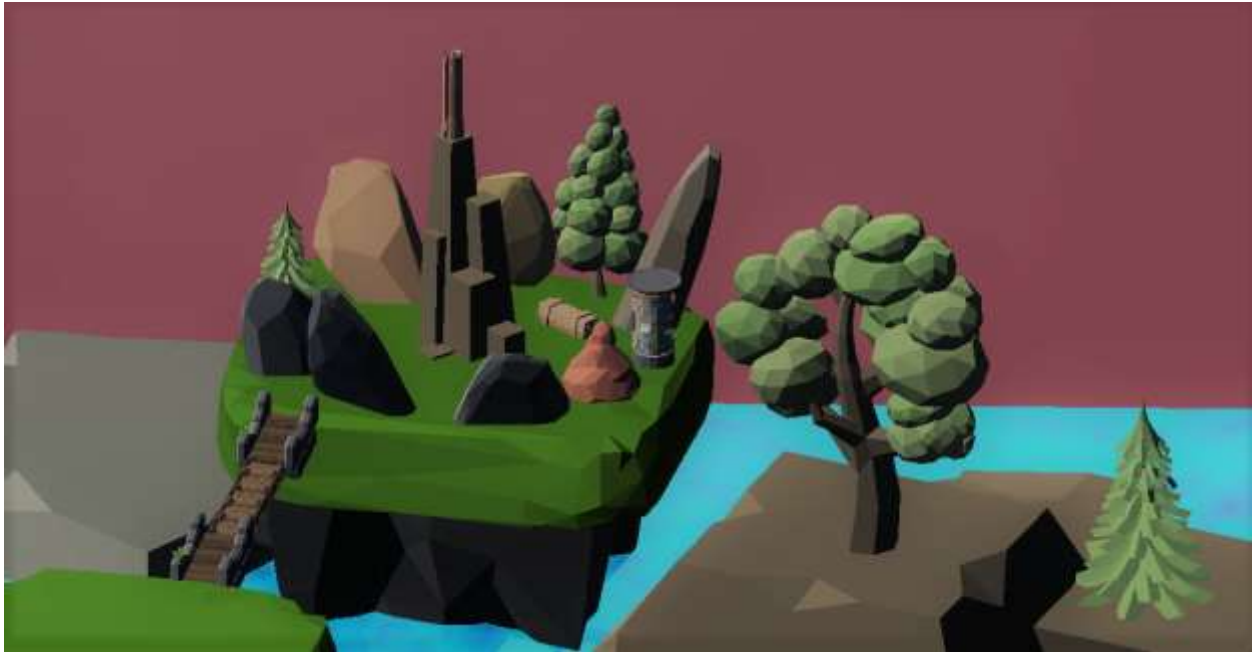


Figure 14 shows the Fast Travel Stones, part industry and part mysticism.



Figure 15, a resource drop and a message board. The resource drop includes a random assortment of materials that reward the player for finding a Fast Travel Stones location. The Message Board allows the player to read posts from other human players.

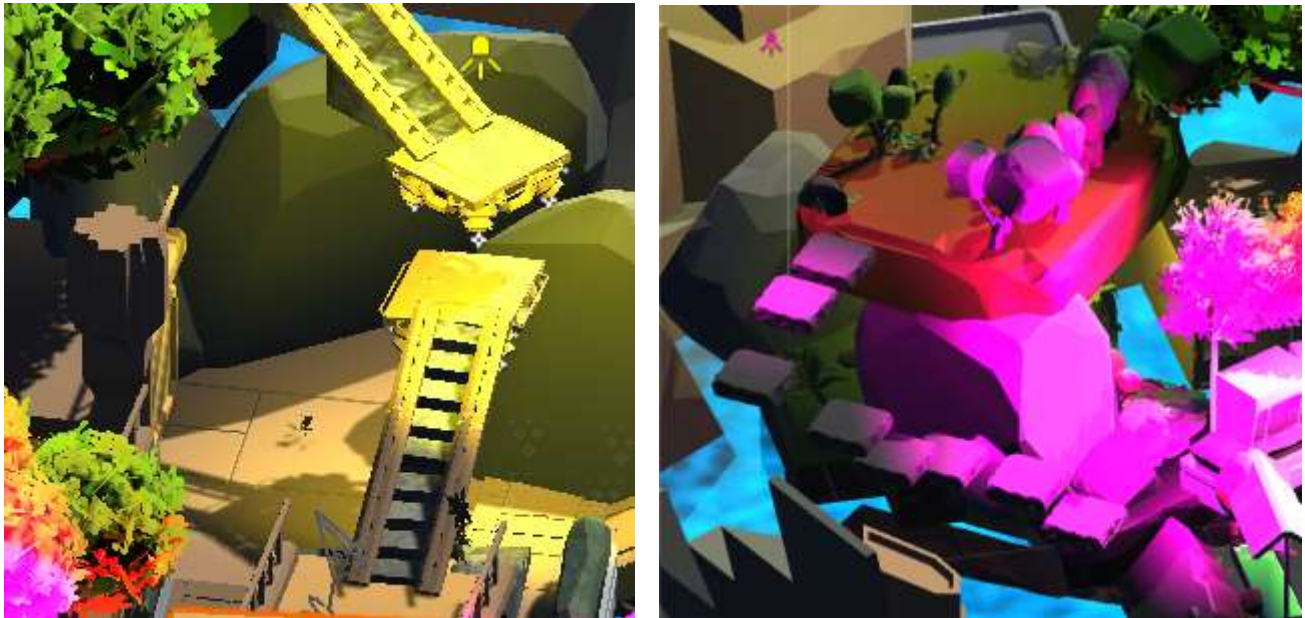


Figure 16, Player must jump (tap motion) to traverse some obstacles and bridge spatial gaps in the world.

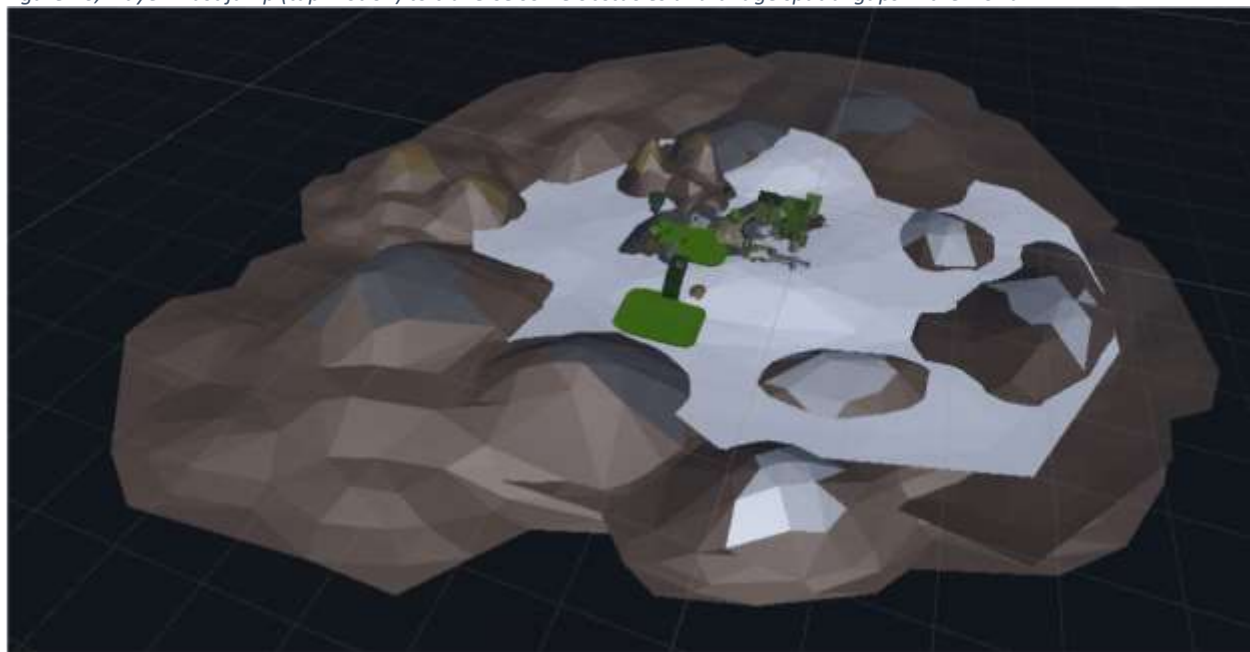


Figure 17, Twin Oaks City Under Ice and Snow (mountain ranges represent island boundaries)

UI & HUD Design



On inventory and other UI canvas components, resources and equipment icons. Spatial and color pairing suggest the center icons are collectables (numbered) with the two icons on the right, in gray, representing base equipment that can't be changed. In the upper left, where the player can view the

menu and help sections, he can also view a list of quests and view recent NPC dialogues for quest clues and reminders. In the lower left-hand corner of the screen, a motion bubble is indicated for mobile character movement and general mechanics.

Cognitive & Emotional Design, Incentive Systems, and Social Design

To embody an integrated design process,^{vii} my goal is to create a game that engages players on four levels: affective, behavioral, cognitive, and social/cultural. Affective design factors of my game include those of *representation* (player customizes character and makes mirroring decisions that are reflected in character actions) and *interaction* (player interacts meaningfully with NPCs and with other human players, with whom the player may collaborate in-game).^{viii} My game has a strong focus on narrative elements that drive curiosity and engagement, with narrative incentivizing the player to behave ethically, seeking to achieve and accrue benefits not just for the player character, but for other human characters and NPCs, whose world should feel rich and attractive to the player (somewhere he *wants* to spend time and *make better*). Narrative provides not only an opportunity for affective engagement, but also for complex behavioral, cognitive, and social-cultural activity. The player-character may socially interact with NPCs within a larger social context, which is driven by the needs of the game world: the character's *drive* to repair and rebuild his hometown. Player may experience observational learning, here, both by viewing NPC behaviors and by interacting with other player characters in the game world, who are solving problems, making discoveries, and participating in a wider learning culture in their own social context—layered on top of, and within, the game world's social ecosystem.

Since this game offers the player with a range of interactions (NPC, environmental, other players, etc.), there are many opportunities in-game for player feedback. My goal is that the environment provide most player feedback, rather than for feedback to primarily be given by NPCs. The player should be given ample time to complete tasks, allowing him to fail, observe his failures, and make many attempts before succeeding. Scaffolding the player's feedback, this is where I might begin: by teaching the player that recurring attempts result in eventual success—rather than teaching the player that, should they get stuck, they will be bailed out by an NPC with a magical solution. In this way, my goal is for the player to become his own primary source of feedback, driving him to more closely reflect and more carefully behave in the narrative game world. For this to work, however, I will have to take care with character design, with NPCs taking on essentially narrative roles that embody, without overshadowing, their roles as motivators (quest and goal givers, interest-drivers, and virtual guides).

The player will be incentivized to engage in a game-based learning experience primarily through the *fun of play*, but also through in-game rewards: resource acquisition, level-ups, skill tree expansion, gameplay bonuses that remove assumed-to-be inherent game obstacles, like travelling long distances). The game is intended to be a social, interactive, and expressive environment for the player to behave creatively when presented with a problem; this means the player must *be able* to solve the problem in a number of ways: talk to it, investigate it, blow it up, bury it in a hole out back, etcetera. This would be an incredibly complex undertaking, of course, but I feel it would be essential to providing students with an experience that mirrors that of true exploration and organic play, which I feel is necessary to lasting and meaningful learning experiences.^{ix}

As should by now be apparent, my game is very much an open-world survival game, but *without a primary combat component*. Rather than exploring the world and *killing bad guys*, the player (1) explores the world, (2) encounters people who need help solving complex problems, and (3) goes about solving these problems however he can. It is important, if this is to work as a basic game and learning

mechanic, that every problem be different, so that the player does not become acclimated to any single problem-solving methodologically. For instance, some problems should *not* be within the power of the player to actually solve, although he should feel compelled to do so; other problems may have a wide range of beneficial or harmful effects (depending on the player's choices); and other problems, still, may always have the same outcome, regardless of what decision the player makes. In this way, the player learns that *choice matters*, but it also privileges *observation*, which is—in my opinion—the most important and formative element required for this game and learning experience.



Figure 18, Fast Travel Icon

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The player will be incentivized to engage in a game-based learning experience primarily through the *fun of play*, but also through in-game rewards: resource acquisition, level-ups, skill tree expansion, and gameplay bonuses that remove assumed-to-be inherent game obstacles (like travelling long distances). The game is intended to be a social, interactive, and expressive environment for the player to behave creatively when presented with a problem; this means the player must *be able* to solve the problem in several ways: talk to it, investigate it, blow it up, bury it in a hole out back, and so on. This would be an incredibly complex undertaking, of course, but I feel it would be essential to providing students with an experience that mirrors that of true exploration and organic play. In this way, the player must have ample agency to act, choose, and behave in diverse ways within a forum for organic behaviors.

The player learns from his environment, choices, and the results of those choices, as well as from viewing other player and character behaviors; in *Junk & the Sunken City*, other game players may be physically visible in the game world (like in *ESO* or *Fallout 76*), but it is not required that the player

FAST TRAVEL STONES

Fast Travel Stones are travel and exploration incentives that can be found in cities, towns, caves, and other important landmarks. The origin of these ancient structures is still a mystery, but some locals say that the stones appeared hundreds of years ago following a massive floor. Whatever their origin, **fast travel stones** possess a, ancient landmarks whose magic essence has been harnessed by science! At these locations, a circle of stones surrounding a black hole that allows the player to “rei” through space. The fast travel system is locked until the player character completes Chapter 1 [has the electricity grid operating].

character interact collaboratively with other players. It *is*, however, of benefit to the player, who can solve more complex problems, or solve certain problems more quickly with additional player support and feedback (Squire, 2008).^x An integrated chat system will allow players to more deeply and relevantly problem-solve when individual challenges become too great for a single player to complete independently (occasional tasks will require multiple players be involved in quest completion, although in most situations, the player is not required to play with other human players).

As should by now be apparent, my game is very much an open-world survival game, but *without a primary combat component*. As Squire points out, in the open-world format, there is no one correct way to go about solving a problem.^{xi} Therefore, rather than exploring the world and *killing bad guys* in order to solve the world's problems, in *Junker*, the player (1) explores the world, (2) encounters people who need help solving complex problems, and (3) goes about solving these problems however he can. It is important, if this is to work as a basic game and learning mechanic, that every problem be different, so that the player does not become acclimated to any single problem-solving methodologically. For instance, some problems should *not* be within the power of the player to solve, although he should feel compelled to do so; other problems may have a wide range of beneficial or harmful effects (depending on the player's choices); and other problems, still, may always have the same outcome, regardless of what decision the player makes. In this way, the player learns that *choice matters*, but it also privileges *observation*, which is—in my opinion—the most important and formative element required for this game and learning experience.

Learning is a completely voluntary behavior (Suits, 2011),^{xii} and so the game world must motivate the player to voluntarily engage in learning tasks, or tasks that were (at least at first) uninteresting. To do so, I aim to make uninteresting tasks, such as resource gathering, vital to long-term player character development, and for character development to take on a major role in the game—with quest lines and entire NPCs devoted solely to player character development, both narratively and otherwise. Player should become practiced in long- and short-term planning, such as considering which skills to develop and in which order, or considering which resources to spend and when, and this will become only more crucial as the player character comes into an identity of his or her own. To this end, learners should also be allowed to play at their own pace and to explore the world's locations in whichever order they choose. In this way, the game is already segmented, with different quest lines tiering in difficulty based not on their order or arrangement, but on the player's current level when accepting that quest; therefore, the player will never be given a Level 20 quest, for example, when he is Level 3.

Cognitive design should also provide special contiguity in UI layout movement controls on lower left and right; resources in lower center; switchable equipment always in upper left), with attention split only on later levels when the character is expected to apply multiple learned solutions simultaneously for more complex or advanced quests.

For the player to learn an array of skills and theoretical frameworks that reflect a deeper understanding of material science, the game's narrative and player expectations must move clearly, slowly, and easily between its various stages (and in order of increasing complexity). In the very first scene, for example, the player begins in a small, relatively empty space, with a clear and visible "exit" available for them to more appropriately enter the game world. This will ensure that, before he comes upon a true game challenge, he has already mastered game controls (moving, and then jumping). In the included Unity project file, I have provided two game scenes that provide this sort of player feedback; in one, the player starts the game on a small platform and is expected to run to the end of the platform and jump to the next one. If the player doesn't jump, he will fall into an abyss and be "respawned" at his

original location. At this level, there is no repercussion for this behavior, as will be the case later on in the game.

Game Mechanics

Inventory Mechanic

Following with Clark C. Abbott's definition of a serious game, in *Junk & the Sunken City*, the player character must participate in a range of both interesting and uninteresting activities, including resource management, which applies a limitation context that structures player activity (Abbott, 2008). The inventory allows the player to gather resources, materials, and items from the environment, but its space capacity is limited. Over time, the player should observe that once a certain number (this would have to be determined in iteration) of resource items are collected, the player will be unable to collect more, forcing them to either dispose of them, use them, or trade them with an NPC. Here, we might add a mechanic that "punishes" the player for "taking more than is necessary" from their environment, although I expect that the above limitation mechanic will be enough to force players to more closely observe their own use and disposal behaviors.

Building Mechanic & Repair Sites

Repair Sites are locations scattered throughout the game world that can be rebuilt by the player using a large amount of collected resources. These are long-term commitments by the player that, upon building completion, will reward the player in several ways: (1) repopulating NPCs in the area; (2) providing the player with permanent boosts to speed, health, or O₂ capacity; or (3) providing the player with special items and equipment. Repair sites are often tied to main NPCs who need buildings to be refurbished prior to quest continuation.

Puzzle Level Mechanics

Puzzle levels are speed mini-games where the player must jump, leap, and climb to reach the destination in time; if they don't, they will run out of oxygen or health (depending on the level) and be sent back to the laboratory for medical treatment before allowing to continue play (this system is inspired directly by the Pokémon "fainting" system, which causes player characters to "pass out" when they or their Pokémon would otherwise "die," punishing the player with lost currency).

Learning Mechanics & Counter-Mechanics

The primary learning mechanic of the game is inherent in the game's touch interface: the player swipes objects *towards* themselves to gather them—reflecting the motion of collecting recyclable and reusable items from the world at-large. The player then, in an appropriate facility, presses and applies physical pressure, or swipes the item *away* from them, to reflect motions of reuse.^{xiii}

The higher-level learning mechanic is the ability to categorize, organize, and apply materials in the world. The game's socio-responsive goal is to instill players with an appreciation for the value inherent in reducing and reusing. While the player must spend resources, he must also, as a primary counter-mechanic, reduce resource use for full effectiveness, reward, and success. The player must use resources *wisely*, not just *widely*. The player is, thus, not rewarded just for finding a resource, but in

executing it effectively. At various points in the game, the player is rewarded for *not* carrying a full supply of a given resource that might otherwise be used by the locals, who will collect it and put it to use in their trades.

Trades Mechanic

The Trades System represents a society of widely varying specialties and resource requirements. Every NPC possesses a specific trade and series of skills, allowing them to be applied more creatively and specifically during narrative and quest progression, and expanding upon roles as quest- and reward-givers. Materials are each broken down at specific break-down locations, which are run by NPC specialists.

Player Resources

The player collects resources as he traverses the world, but also possesses resources that can only be used in trade or for special upgrades, as shown below.

- **Food Waste:** Can be (a) COMPOSTED and broken down to create SOIL, or (b) immediately reused as animal or plant feed, depending on the type of food waste. Egg shells, for example, can be immediately placed in SOIL to increase Nitric Oxide (NO) production.
- **Metal:** Can be broken down at a SMITHY.
- **Paper & Textiles:** Can be (a) COMPOSTED or (b) RECYCLED to create a number of textile-based objects required for quest completion. These may include INSULATION, BOOKS, or any other fabric-based, post-consumer product.
- **Plastic:** Can be RECYCLED for reuse in any plastic manufacturing, such as PARK BENCHES, SHOES,
- **Glass:** Can be melted down at the Smithy.
- **Trash:** Trash must have its contents analyzed at JUNK COLLECTORS. TRASH pick-ups may contain recyclables, compostables, and so on.
- **Money** – For buying, trading, and participating in the local economy. Earned through mission and quest completion.
- **Equipment Points** – Special points given by NPCs that can be used to upgrade character equipment. These place added emphasis on social interaction and social thinking skills.

Breakdown Locations

Breakdown Locations are important quest points that allow the player to break down items that they have collected from the environment.

- **Compost Plant** – Breaks down FOOD WASTE, PAPER, and TEXTILES to create soil for FARMING. Maintained by **Farmers**.
- **Smithy** – Breaks down METAL & GLASS. Maintained by **Smiths**.
- **Loom** – Break down PAPER & TEXTILES. Maintained by **Weavers**.
- **Synthetics Reactor** – Breaks down PLASTICS. Maintained by **Synthetics Experts**.
- **Compactor** – Crushes any solid material, especially SOLID WASTE (not recyclable), into a cube shape, which is then coated with SYNTHETIC materials to form BRICKS to upgrade and repair buildings and town locations.

Character Design | Attributes

- **Health Points** – Health Points are lost when the player encounters and stays in contact with hazardous materials. Health Points refresh on their own over time, but player must be outside

of a hazardous zone for this to occur. If player loses all health, he passes out and is sent to the laboratory to recover.

- **O₂ Counter** – Player character must navigate dangerous chemicals, underwater landscapes, high altitudes, and smoke-filled areas. In these locations, character requires stock of O₂.
- **Geiger Counter (GC)** – Shows player the ambient radiation levels that they are experiencing. Radiation levels are shown when player enters irradiated zones, but are otherwise not shown.
- **Experience Points** – Player receives XP for completing quests and missions. XP builds until player levels up.

Character Customization

As player completes quests and gains experience, he also gains increased maximum health and O₂ points, plus special skills. At Level 1, the player chooses a special skill that will impact their gameplay permanently (see below); they will then be able to pick an additional **special skill** every 3 levels.

Character Level	Skill Points Available	Health Points	Maximum O ₂	Special Level Bonus
1	1	100 (+0)	100 (+0)	New Special Skill: Player's Choice
2	1	120 (+20)	120 (+20)	<i>Player movement speed increased by 5%; player O₂ now drains 5% more slowly when in hazardous environment zones.</i>
3	2	140 (+20)	140 (+20)	Player money gain increased by 5%; player gains a 10% to gather <i>double</i> with every resource pick-up.
4	2	160 (+20)	160 (+20)	New Special Skill: Player's Choice
5	3	180 (+20)	180 (+20)	<i>Player inventory size increased by 20%; merchants will sell items to player at 20% discount (stacks with special skills).</i>
6	3	200 (+20)	200 (+20)	<i>Player health or O₂ increased by an additional 20 points (player's choice).</i>
7	4	240 (+40)	240 (+40)	New Special Skill: Player's Choice
8	4	280 (+40)	280 (+40)	<i>Player movement speed increased by 10%; player O₂ now drains 15% more slowly when in hazardous environment zones.</i>
9	5	320 (+40)	320 (+40)	<i>Player's choice: 30 extra seconds for speed-based mini-games; .</i>
10	5	360 (+40)	360 (+40)	New Special Skill: Player's Choice

Skill Points

With every two level gains, character is given an extra skill point per level gain, increasing the use value of level gains and developing a long-term planning mechanic for skill point spending.

Special Skills

- **Veterinarian** – Allows the player character to talk with animals in the world. These may include bugs, lizards, birds, mammals, or any other animal that can make auditory sound. Player may now interact with these creatures or work together with them collaboratively. For example, the player character may require some flies for a quest (experiment), and may work collaboratively with a nearby toad, who catches flies for the player in exchange for the player's help finding him a new home.
- **Webbed Feet** – Player character now swims twice as quickly. If player possesses the flippers (received near the end of the game), this skill will increase player swim speed by 50% on top of additional 100% swim speed provided by flippers (for a maximum of 250% swim speed).
- **Hacker** – Player can now use characters' personal computers (found in their homes and businesses) to fast travel. **(Required: Level 7 or above).**
- **Merchant** – Purchased items and resources are 25% less expensive; player may now also sell items at 25% higher cost. **(Required: Level 4 or above).**

Example Game World Locations:

- *Laboratory*
- *Sinkhole*
- *Zoo*
- *Hessian Lake*
- *Hospital*
- *Elementary School*
- *Public Library*
- *Nuclear Power Plant*
- *Ostritch Lookout*
- *Peakskill Peak & Playground*
- *Mount Luka*
- *Nature Reserve*
- *Hot Springs*
- *Police Department*
- *Fire Department*
- *Material Recycling Center*

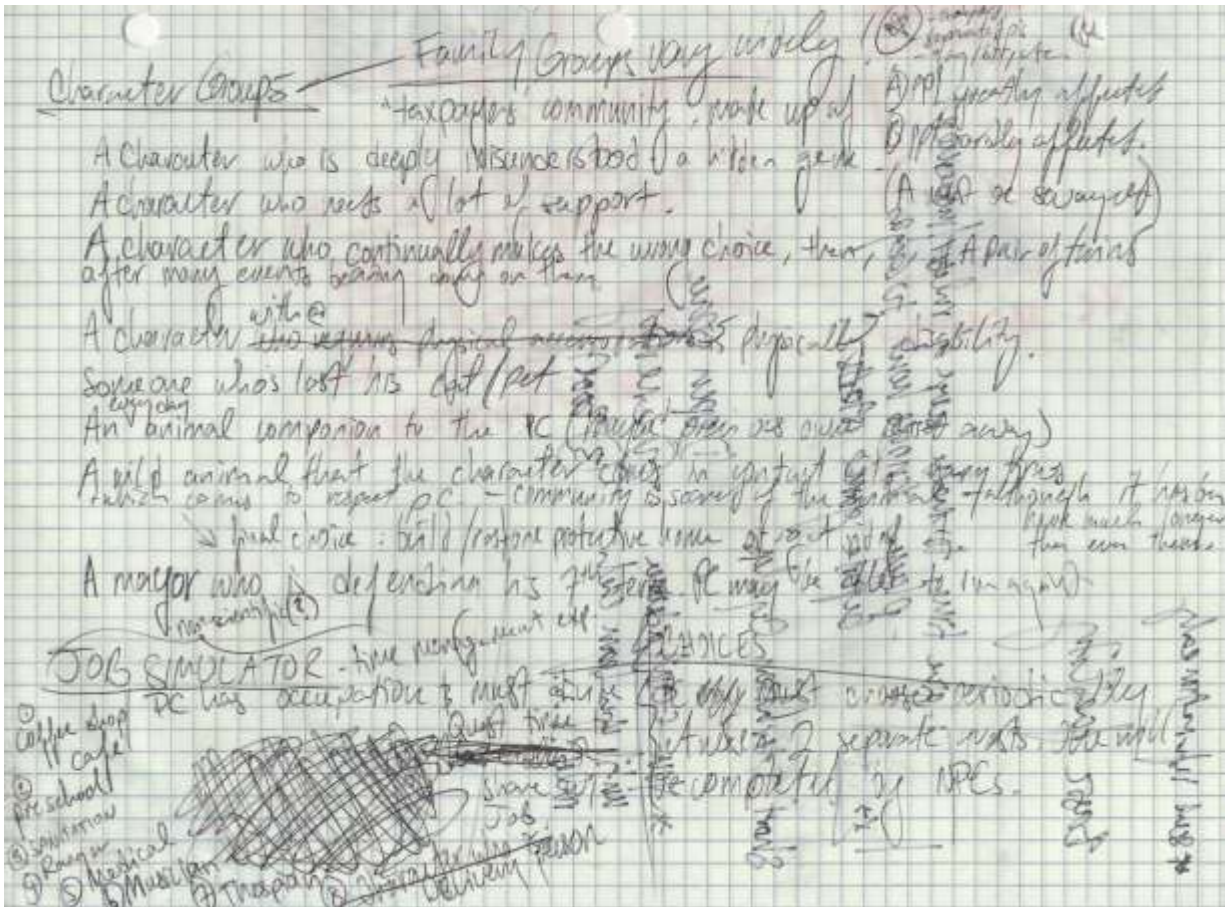


Figure 19, Draft of Character Breakdowns



Figure 20, Character Image Banners (Storyboard Sketches)

Walkthrough & Narrative Design

Twin Oak City is under water and needs your help! People are trapped in their homes. Zoo animals have escaped and have taken refuge. Hazardous materials have been released from energy production facilities, leaving the environment poisoned and in danger. The player character, a line cook working at a local greasy spoon diner, is tasked with protecting the city. From one disaster to the next, a sort of environmental cataclysm. Harkening to the political situations in Puerto Rico, Florida, and New Orleans in recent, devastating natural disasters, the game's narrative showcases how little support is given by outside governments during such events, and how local governments can completely shut down and citizens left to fend for themselves. For this game, I performed comprehensive research into the social, environmental, and economic fallout from natural disasters.

The game's narrative begins just days before the cataclysm, with a set-up scene that reviews the game's location and themes, and establishes the world as it existed before the disaster that precipitates the game's primary action:

Camera pans across the ground, zoomed in on the tips of some perfectly still grass blades. They rustle. We pan down to a crawling beetle. A massive, warped eyeball materializes behind a closely-held magnifying glass. Cut to a scientist scribbling on her palm in marker. Cut to a top-down isometric pan over a small mountain city, ostensibly modern. Shot of citizens gathering at an open market. Shot of a priest sitting at his window-side desk, overlooking the market. He peers outside as he considers a sermon; he crumples and tosses out a sheet of paper, revealing an overflowing recycle bin. Cut to a young but bald man standing at the mouth of an open cave, taking a deep breath to steel himself before an expedition. He pulls on a spelunking helmet before strapping on a hiking pack and stepping into darkness. Pause at the cave mouth before a shot of an old man fishing by some docks. Camera dips beneath the water, where a school of minnows meanders. Out of nowhere, a giant salamander emerges, swallowing one of the minnows whole. As the dust settles, we see a soda bottle half-sunken in the sand. A tiny crab emerging from it, then disappears into the bottle when a shadow passes overhead. Cut to the outside of a diner, then to the gloved hand of someone behind the counter hitting a bell and hanging a new order on tab. Through a small, steam-filled window, two gloved hands maneuver around a couple burger patties on a hot top. O.S., a voice: "LOOK AT THAT, A NEW HIRE! YOU JUDY'S KID?"

Player is prompted to create a player character using customizable visuals. After the player completes creation, the scene blacks out and refreshes on the player character taking a nap at work. This leads to our first quest completion, indicated by pop-up text: "Quest Completed: Rise and Shrine: WAKE UP," after which the player gains 25 XP points. The player's boss sends him outside to get some berries from the woods, and here the player experiences game movement for the first time. Entering the woods triggers the player's next quest, "Arnold the Duck".

In the woods, the player finds a duck rummaging around; every time the player finds a berries bush, the duck appears out of nowhere and snags the berries from the player's reach. On the third bush interaction, the player grabs the berries just in time, then uses them to coax over Arnold the Duck, which is then added to the player's inventory. The player isn't allowed back at work with the duck, but is told to deliver the duck instead to the laboratory. There, the player encounter's SARA, a scientist running around frantically. During a dialogue, the player hands over the duck and Sara erupts in gratitude, asking the player to come back the following day. When he does, a new adult scientist named Arnold will be present. He will reward the player with *KEVLAR GLOVES* (allowing the player to handle hot objects) and an *ID BADGE*, allowing the player 24-hour entry to the laboratory facility, which can be used to break down any material, but very slowly compared to specialized breakdown facilities, such as the Smithy.

Evaluation

As Mayer reports in his player learning assessment research,^{xiv} it is essential that assessment be specific, wide in its scope (to account for the impact of varied game mechanics), and that it use methods that allow for direct investigation (Mayer, 2014).^{xv} Learning outcomes in *Junker & The Sunken City* can be measured directly through pre- and post-assessment testing,^{xvi} which can be performed in physical space by presenting players with breakdown materials (plastic bottle, newspaper, a glass cup, and a potato), then asking that they put them in the appropriate bin before them (trash, recycling, and compost).^{xvii} This, at least, will show whether the players' understanding of recycling has improved; but how can we show whether players have gained a positive association with recycling, reuse, and resource use reduction, or whether they believe their changed behaviors will have any impact on the environment at-large?

As Juul writes, you cannot divorce a game's story from its learning mechanics, which in turn complicates the evaluation of a game's actual learning impact.^{xviii}

While Juul, Jenkins, and Gee write broadly on narrative and its impact on attention and information processing (and thus topics mastered), I believe that more can be said about how narrative and learning mechanics can work together. In *Junker & The Sunken City*, the story follows Junker as he journeys across a semi-natural, semi-industrialized landscape that has been ravaged by natural disasters. Not only does the player character *observe* the impact of material sciences on the immediate environment, but is tasked, by NPCs, to delve more deeply into a socio-cultural framework of viewing the individual (or "player") as a steward of the environment. To assess whether this is the case, my game will also require pre- and post- assessment in the form of self-reporting, asking the player to report on his belief of the importance of material sciences to the environment (numerical scale) as well as a written or spoken description for additional post-comparison.

SIDE QUEST EXAMPLES:

1. **SEARCH & DESTROY:** [becomes available once ARNOLD THE DUCK quest is complete. Infestation of roaches in the schoolyard. Player can: (1) Eradicate the infestation [REWARDS: NIGHT GOGGLES, +1 SKILL POINT IN CHEMISTRY] OR (2) Collect the roaches and give them to the Laboratory for further study. [REWARD: SCUBA MASK, +1 SKILL POINT IN BIOLOGY]
2. **CLEAN & CLEAR:** Clear areas of dangerous chemical leaks.
3. **SEAL & SECURE:** Secure locations with rampant hazardous waste so that waste materials cannot leave and infect other areas; this is ONLY for very high-level waste materials that are too dangerous to remove safely.
4. **UMBRELLA SEASON:** Zoo animals all escape and are starting to eat each other. Some of the endangered species are missing. You go down to THE OAK CITY ZOO, find them, and bring them to safety.
5. **ICARUS FILTER:** The water is tainted and must be purified. [Solution: Use burnt trees (coal) and straws to make water filters. "At least something good came of that fire!"]
6. **Trapped Commuters:** The seaside train has flooded, trapping passengers inside their trains. [Solution: enter the station using a scuba suit.]

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