Environment

Thing

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# Analysis

## Client Profile

Who: My client is a Year 13 student who is excellent in academics and loves immersive video game experiences, like The Legend of Zelda, Stardew Valley, and Animal Crossing. He enjoys these games as they are very relaxing, especially amid the A-Level stress. He also has a keen interest in learning about the environment but feels that he doesn’t have enough time to learn about these issues on top of his A Levels as he believes he’d rather spend time studying for his subjects and relaxing.

Interests: The client is very interested in video games and are specifically interested in games that promote freedom, creativity and problem solving. He’s also very interested in learning more about environmental problems in the world.

Skills: The client is very skilled at problem solving and thinking efficiently; however, he also has a keen eye for art and taking things slowly to achieve the best outcome. He plays a lot of video games and is familiar with standardised gaming mechanics and controls.

Preferences: The client prefers specific graphic styles and enjoys both single and multiplayer games. He enjoys the challenge of discovering and unlocking content, providing a goal and achievement.

Motivations: The client has a desire to improve their knowledge on many things, like the environment, and also to improve at many varieties of games, as well as the social aspect of solving things with friends as a group and competing against them.

## Project Background

### Problem

In the 21st century, we face serious problems like environmental damage and climate change. However, many people, especially young people, don't know enough about these problems. This lack of awareness is caused by several factors: schools don't teach enough about environmental issues, people don't have easy access to accurate information, and many people don't see how these global problems affect their daily lives.

In traditional education, environmental and climate issues are often not given enough importance. School programs might not go deep enough or be relevant enough, leaving students unprepared to understand and deal with these important problems. Also, teachers may not be well-trained enough or have the resources they need to teach about the environment effectively.

In today's digital world, where information is constantly overwhelming us, it can be difficult for young people to distinguish between true and false information. Environmental issues are often the subject of conflicting claims, which can lead to confusion and indifference. Additionally, social media, although a valuable tool for connecting with others, can also spread false information and create isolated groups that reinforce existing beliefs, making it harder to have open and informed conversations. Social media platforms also create echo chambers in people’s social feeds, leading to the information not being viewed unless it’s searched for. This can just cause unawareness, or people seeing media that may not be true or biased.

The gap between understanding environmental issues on a conceptual level and facing their real-world impacts makes it harder for people to be aware of them. For many young people, the effects of environmental degradation may feel far away or unclear, especially when they're focused on things like school, friends, and future jobs. This can lead to environmental issues not getting the priority and seriousness they should in the minds of younger generations.

It's vital to raise awareness about environmental issues to create well-informed and capable citizens who can help find sustainable solutions. Additionally, using technology and new teaching strategies can make environmental education more interesting and easier for people with different learning styles to grasp.

To tackle the lack of environmental awareness in youth, my project will be creating an interactive game that incorporates features about environmental issues. This game will put players in virtual worlds that are like real-world ecological challenges. The goal is to help players understand environmental conservation and sustainability better. Through engaging stories and gameplay, players will explore different ecosystems, learn about pollution, and find ways to stop climate change.

### Investigation

#### Survey Results

What are your gaming preferences?

From this data, it is clear that making a game for the PC platform is advantageous as it allows a wider range of people to play it as consoles are harder to access by the current generation than the PC. This also means that we have to consider performance optimisations since the PC platform can range from lower-end laptops to higher-end PCs. These people could also enjoy the other games listed.

Aspects of these games that you enjoy the most? (Select all that apply)

These aspects of games are very prevalent in a successful video game, because they provide interesting exploration and positive game loops for the player to enjoy, one such example is placing interactive puzzles around a game map to acquire rewards, this links to creative freedom, to allow players to accessorise or customise their avatar or area. Immersive storytelling is a harder aspect to consider, however one method which is particularly popular is placing props around for the player to discover that relates to the story or the gameplay.

How interested are you in learning about environmental issues?

From this data, we can see that many people would like to have elements of environmental issues in media they are exposed to however no one from my data capture selected extremely interested. Perhaps people find it tedious to extensively commit to research on the topic or do not consume media related to environmental issues. As such, considering a balance between helpful education and enjoyable experience is important.

Would you like to see environmental themes integrated into video games you play?

Similar to the previous question people prefer subtle themes for immersion. The respondents probably do not appreciate large blocks of complex texts, especially considering that people may have different levels of play duration so may appreciate getting through gameplay much quicker.

Do you prefer single-player or multiplayer games?

From this, we can see that multiplayer is appreciated in games. This means considering interactions between players would be beneficial for creating my game. For example, a shared balance between players so would get them to work together to achieve a goal and prevent debt. A shared plot to play on as well incentivises co-operation and planning.

A colorful circle with a red green and blue circle

Description automatically generated

This leads on from the previous question, however considering a chat function may also be beneficial for players who don’t use social media apps to communicate or may just prefer a streamlined experience. Competition in Life-Sim games may include a levelling system or other measurable statistics that could be managed perhaps in the form of a leaderboard.

A screenshot of a computer

Description automatically generated

Although the audience prefers a cartoonish graphics style, pixel art is probably more manageable in a shorter time frame.

A graph with different colored bars

Description automatically generated

From this data, we can see that many of these environmental activities would be appreciated in games however it should be noted that fewer people appreciate less immediately positive actions like cleaning up pollution and educating the players therefore it could still be considered with a higher reward as a motive.

## Market Research

### News Article

News articles are frequent sources of global information updates for most people. It keeps the general public informed about politics, world news and various other things. The problem with many tabloids and news articles is that many are biased and so provide unjust views and untrue facts to readers. This can result in a twisted point of view from the reader and can lead to a belief in incorrect facts and lead to extremist views. More so, they can also provide contrasting views from author to author, leaving readers feeling conflicted and not knowing what sources are truthful.

The Daily Mail news article is a perfect example of posting articles that portray misconstrued facts.

A screenshot of a phone

Description automatically generated

A screenshot of a computer

Description automatically generated

A close up of text

Description automatically generatedThis is an article posted to the Daily Mail news article on 23rd of March 2023. The vocabulary used in the article is an attempt to imply or villainise environmental agencies. By using language such as “claim” when talking about environmental groups’ outward opinions, it’s creating disbelief in the readers of the actual scientific groups. Describing their efforts on an “Armageddon” further exaggerates this belief. The destructive language does nothing but harm the reader’s beliefs.

This article is also not very accessible as it has long paragraphs with smaller texts that could be hard for someone with sight difficulties to read. It also has complex words and structure that some may not be able to understand for varying reasons.

* My solution, compared to this news article will not relay unreliable facts and information by only using proven and reliable methods about environmental issues in my project, it will also be easy for all consumers to use. This could be done by incorporating features like a bigger user interface (texts, inventory, etc.), high contrast for text boxes, and simplified information so that all users can understand. My solution and this article are both biased however, as my solution will come from the opinions of someone who believes saving the environment is crucial, whereas the article focuses on what environmental groups are doing to raise awareness and calling them out for it in a dramatic way.

### Games

Games are used for entertainment by most young people. They are often used to promote messages to the user, as a indirect way to influence the user into changing habits, or changing their outlook on different aspects of life. The problem with many modern games however is that most don’t have anything meaningful to them, and are often seen just as a way to kill time, without looking for anything deeper or exciting behind it.

#### Stardew Valley

Stardew Valley is a great example of this, as it is an open-ended game focused on relaxation, creativity, and storytelling. Stardew Valley is a Farming Simulator / Life Simulator that focuses on the player creating a farm, building relationships with NPCs.

Stardew Valley offers a plethora of gameplay mechanics that could satisfy the client’s needs. One key aspect is the farming mechanics, which allows players to cultivate crops, raise animals and manage their farm. This promotes creativity, planning and management, offering a relaxing and rewarding gameplay experience that the client enjoys.

Additionally, the game features relationship-building mechanics, encouraging social interaction and collaboration through interactions with NPCs. Players can engage in exploration and questing, discovering secrets and completing tasks in a vast and diverse game world.

Crafting and customization options allow for personalization, while seasonal events and festivals provide variety and excitement. Fishing and mining activities offer additional depth, and time management and planning are crucial for success.

The problem with Stardew Valley, is though it may include all these features, there is no way to prevent “industrialization” or “min-maxing”, which is minimising portions of play that do not have value, and maximising portions of play that have great value or where players automate the mechanics of the game to maximize profit and outcomes.

A video game screen shot of a garden

Description automatically generatedThis is an example of the farming mechanics in Stardew Valley, where the whole farm has been covered in crops to maximise the profits of the in-game currency. This promotes unsustainable ideas in farming that my solution will attempt to avoid.

* In contrast to Stardew Valley, my solution will prioritize environmental aspects within these mechanics to counteract "min-maxing," the practice of maximizing valuable gameplay elements while minimizing less beneficial ones. This issue is particularly pertinent in games centred on sustainability and environmental themes. Demonstrating a commitment to ethical game design and responsible practices will align with the client's interest in environmental education. Additionally, my solution will integrate tangible environmental conservation mechanics, offering educational value and raising awareness to inspire real-world environmental action among players.
* Features such as customizable farming, relationship-building with NPCs, seasonal events, exploration of a diverse world, and activities like fishing and mining will be incorporated into my solution, mirroring the engaging gameplay elements found in Stardew Valley. These features will provide players with a rich and immersive experience while promoting environmental awareness and sustainability practices.
* Stardew Valley implements procedural generation algorithms to create randomized layouts for certain elements of the game world, like the layout of the farm, mines and caves. This ensures that each playthrough feels unique and provides fresh challenges and experiences.

NPCs in Stardew Valley navigate the game using pathfinding algorithms to determine the most efficient route to their destination. This allows NPCs to move around the world smoothly and interact with the environment and other characters.

Stardew Valley features random events that occur throughout the game, such as weather events, and encounters with wildlife. These events are generated using randomization algorithms to add variety and unpredictability to the gameplay experience.

Stardew Valley uses a circular algorithm (circular queue) to repeat the seasons indefinitely with 28 days per season.

Stardew Valley also has a few accessibility features, like increasing UI size, show hit tool location and disabling flash effects in the game. However, Stardew Valley doesn’t have a tutorial, so the player is left to figure things out for themselves, and most information in the game is unavailable while playing and must be searched for via. A Wikipedia or game tutorial posted outside of the game.

#### Animal Crossing: New Horizons

Animal Crossing: New Horizons is a widely recognised life simulation video game. This game has won the hearts of many with its enchanting and soothing gameplay. Interactions in Animal Crossing involves an array of activities like fishing, capturing bugs, unearthing fossils, and cultivating a garden to acquire in-game money and elevate the village. The game follows real time, has rotating events like seasons and day cycles, providing a captivating and engaging environment. The flexibility for the player in Animal Crossing is one of its prime features. It offers players the autonomy to establish their own set of goals and dictate their gaming speed.

Animal crossing is a calm and soothing video game valued for its soothing setting and liberty for creativity. The games broad spectrum of customisable features extends from character creation to town development. Moreover, the emphasis on social interaction adds depth to the experience, enabling players to connect with friends and other players through multiplayer features. Animal Crossing also promotes environmental awareness through activities like planting trees, fishing, and participating in conservation events.

However, Animal Crossing is not without its drawbacks. Its real-time progression, while immersive, may require consistent play over an extended period to fully experience all the game has to offer, potentially posing a challenge for players with limited time or irregular schedules. Additionally, some players may find the gameplay loop of daily tasks and routines to become repetitive over time, leading to feelings of monotony or boredom. While the game's open-ended nature allows for endless possibilities, its lack of a traditional narrative structure may leave some players craving deeper storytelling or character development experiences. Furthermore, enjoying multiplayer features in Animal Crossing often necessitates active engagement with other players, which could be limiting for those who prefer solitary gaming experiences or lack consistent access to online connectivity.

* In contrast to Animal Crossing, in my game there will be dynamic environmental challenges that require players to address specific issues such as deforestation, pollution, habitat destruction, or climate change within the game world. Players must strategize and implement solutions to overcome these challenges, fostering critical thinking and problem-solving skills.

Implementing a levelling system in my game, to provide players with a structured progression framework while encouraging them to adopt and promote sustainable behaviours both within the game and in their everyday lives.

Introducing a more co-operative playstyle, beyond visiting other players or trading materials. For example, completing tasks or quests and building your plot together.

Like in Animal Crossing, I could implement a rotating event algorithm for time passing in the day and how that impacts the games graphics, and have a loop for the seasons and days, this could be done using a circular queue.   
To prevent min-maxing, I could use a resource management algorithm to determine how many times a player has hit a tree and stop giving resources after a certain number of hits.

#### Hollow Knight

Gameplay in "Hollow Knight" is centred around exploration, combat, and platforming. Players navigate through a sprawling, non-linear world, discovering new areas, abilities, and upgrades as they progress. The combat system emphasizes precision and timing, with a variety of melee and ranged attacks, as well as defensive manoeuvres like dodging and parrying.

One of the game's notable features is its rich atmosphere and immersive storytelling. The world of Hallownest is brought to life through detailed environments, haunting music, and subtle environmental storytelling. The game's narrative is delivered through cryptic dialogue, environmental clues, and optional lore tablets scattered throughout the world.

This visual allure of Hollow Knight is complemented by exploration mechanics that encourage players to venture into every nook and cranny, rewarding them with hidden accessories, in game currency, lore, and optional areas.

The challenging gameplay mechanics in Hollow Knight require precision, timing and strategy, forcing players to learn enemy attack patterns. The game’s difficulty curve is steep but provides more generous loot for the player as they progress. The in-game currency earned from combat and exploration allows players to purchase upgrades and new abilities.

Despite its many strengths, Hollow Knight is not without drawbacks. Some players may find the game’s steep difficulty curve to be off-putting, particularly in the early stages when abilities are limited. The challenging combat and platforming segments can lead to frustration for those seeking a more relaxed gaming experience. Additionally, the game offers minimal guidance and tutorials in game, which may leave some players feeling lost or overwhelmed as they must figure out game mechanics, abilities and progression paths on their own.

Furthermore, while Hollow Knight excels in creating a rich and atmospheric world, its storytelling can be sparse and ambiguous. The game's narrative is delivered through subtle environmental cues, cryptic dialogue, and optional lore tablets, leaving much of the story up to interpretation. While this minimalist approach may appeal to some players, others may prefer more overt storytelling and character development to enrich their experience. Overall, while Hollow Knight is widely praised for its artistic vision and challenging gameplay, its difficulty, pacing, and storytelling may not appeal to all players equally.

In Hollow Knight the non-playable entities like enemies use pathfinding algorithms to find routes around obstacles towards the player or other targets. The game also uses platforming and combat mechanics that involve interactions between characters, objects and environments. Physics simulation algorithms are likely used to handle the collisions and gravity of in game interactions between the player and other objects to create responsive gameplay.

In my game, I could include some features that are like Hollow Knight, for example using pathfinding for entities to locate the player and find the shortest path around obstacle to the player. I could implement features of physical simulation algorithms, not just for collisions and gravity but to model environmental phenomena such as erosion, water flow and weather effects.

## Objectives

### Feature: Terrain Generation

Details:

Set / Hand-made map for base.

Biomes are predetermined, etc. desert, jungle, forest, river, beach, taigas.

Perlin noise for clumping vegetation together

Values assigned to different types of vegetation.

Clamping lower values for empty spots

High-resolution noise for in-between bushes/shrubs or low-res for free spaces and large clumps of vegetation

Moving cloud silhouettes/shapes using Perlin noise

Measure: big map, five-six biomes, many vegetation types, high/low resolutions

Display: different colours for biomes, smooth/hard transitions between biomes, checking temperature/humidity using tools to determine what grows in select biomes

### Feature: Multiplayer Functionality

Details :

Using TCP/UDP networking protocols as they are reliable with a high throughput rate.  
Data is transmitted between clients and the server using UDP.

* Each datagram contains essential information such as player actions, positions, and game events.
* Datagram packets are lightweight and reduce latency.

In the client-server architecture, one player hosts the game as the server while other players connect to it as clients.

* Server manages game state synchronization, client receives updates from server and render the game accordingly.
* Clients send player action to the server for validation and execution. Server processes these actions, updates game state, and visualises the change to all clients.
* Use sockets to listen for incoming connections.
* Use threading to handle the client (handle multiple client connections concurrently), makes it easier for server to communicate with multiple clients without blocking other connections.
* Autosaving system in case of unexpected server crashes

Measurability:

Network stress testing, server response time, bandwidth usage as number of players increases, number of players.

Display:

Different player avatars, real-time game updates, usernames relating to different players.

### Feature: Modelling environmental dynamics

Details:

Implementing cellular automata, with states that evolve over time according to a set of rules based on neighbouring cells.

Present phenomena in the environment: vegetation growth, habitat fragmentation

Implementing fuzzy logic, which deals with gradual or partial truth values between 0 and 1.

Implemented to model complex relationships between environmental factors and effects on ecosystems: could use vague terminology to determine, temperature, humidity and other things.

Capture uncertainty in environmental processes or NPC ai: such as animal responses to different environmental conditions.

Factors adjusted by player inputs.

Implementing a circular queue to recreate day cycles and seasons.

Measure:

Size of map, size of the grid with cells that can be impacted, how the algorithms respond to more complex rules, input variable variations seeing if it can scale effectively.

Display:

using equipment to measure the effects of climate change over time periods in game, different looks of the game from season to season, higher temperatures creating a less scenic world, less vibrancy, less vegetation

### Feature: Levelling System

Details:

Implement a levelling system to provide players with a structured progression framework within the game.

Experience point (XP) thresholds for levelling up based on a quantifier so it gets progressively harder to level up.

Incorporate mechanisms for player advancement, such as completing quests, defeating enemies, or exploring new areas, to earn XP and progress through levels.

A system of rewards, such as unlocking new abilities, map areas, and content, upon reaching certain levels.

A score to indicate your progression in the and how well quests are completed by the user.

A sustainability score based on players ability to preserve vegetation.

could be indicated by a score that tracks your carbon footprint, having a minimal score at certain checkpoints in the game could entitle the player to more rewards.

Measure:

Number of players, impact on fair distribution of XP and distribution of rewards, xp gain rate and the xp curve.

Display:

Display player levels and XP progress prominently in the user interface, allowing players to track their progression visually to inform players of level-up events and rewards earned. Incorporate an achievement board to showcase player progression and achievements, fostering competition and community engagement.

### Feature: Accessory/Upgrade System

Details:

Completing quests, levelling up and unlocking new areas will unlock new accessories that could provide improvements to statistics: defence, resistance to toxins and speed.

Accessories that improve statistics should only come from main quests that impact progression.

Side quests will include cosmetic accessories that do not affect the in-game experience.

In-game currency implementation to purchase further upgrades and accessories from in-game vendors. This could include higher quality equipment that can make quests faster to complete.

Items being sold to in game-vendors could be implemented as a stack so items can be “bought back”.

Measure:

How many the player can equip, how the accessories may interact with each other.

Display:

Show the player's current inventory of accessories/upgrades in the UI, provide detailed descriptions and stats for each accessory/upgrade, allowing players to make informed decisions about equipping or upgrading them, visual indicators to highlight newly acquired accessories/upgrades or indicate their effects in gameplay.

### Feature: Puzzles / Problem-Solving Activities

Details:

Mazes

Mazes are pre-made and not generated in the game; however location and frequency are random and can be found in select regions of the map.

Mazes generated in areas.

These will only be generated once on map creation.

`Incorporating mechanism-based puzzles:

Pressure plate-based puzzles, using a box or other object placed on a pressure plate to open up a door or opening to an area

Offering a fruit to a statue that appears in set places or after completing puzzles quests and offers an improvement to the players stamina.

Players use an element from fire, water, or earth to trigger a mechanism that has a time-based deadline that resets the puzzle.

Mechanisms from this will sometimes need to be triggered in a specific order that the player will be given clues for to figure out.

The puzzles variety, e.g time based or ordered puzzles will be generated randomly generated for each area there is meant to be a puzzle.

Gradual difficulty curve of puzzles as new regions/biomes unlocked.

Offer tutorials if player fails a set number of times.

Measure:

Completion Time (range from 30 seconds to 4-5 minutes, depending on complexity of puzzle), how many attempts it takes for player to complete puzzle, 3-4 varieties each puzzle, area of puzzle generation.

Display:

Heads Up Display for timed puzzles, a progress to completion bar, different puzzles for different biomes, looks of puzzle and difficulty changes as user progresses.

# Design

# Testing

# Evaluation

# Appendix

## Interview

Interviewer: Hi client, thank you for agreeing to this interview. Could you start by telling me your favourite game and why you play it?

Client: My top pick for games must be "The Legend of Zelda: Breath of the Wild." Its open world and the freedom it provides is captivating. There's something enchanting about exploring undiscovered places, solving puzzles, and facing challenges on my own terms. Additionally, the game's stunning graphics and intricate details make the world come to life. It's one of those games that continuously unveils new and thrilling surprises with each discovery.

Interviewer: That's great! How often do you play video games, and for how long each session?

Client: I usually play video games a few times a week, usually in the evenings or on weekends when I have some free time. As for the length of each session, it really depends on what I'm playing and how much time I have available. Sometimes I'll just squeeze in a quick 30-minute session, and other times I might get lost in a game for a few hours without even realizing it! Overall, I'd say I average around 1-2 hours per gaming session, but it can vary.

Interviewer: What other types of video games do you enjoy playing other than “Legend of Zelda: Breath of the Wild”?

Client: I really enjoy titles like "Stardew Valley" and "Animal Crossing." These games offer a relaxing escape from the hustle and bustle of everyday life. There's something incredibly satisfying about tending to your virtual farm, building relationships with quirky characters, or designing your own little slice of paradise on a deserted island.

Interviewer: Do you prefer single or multiplayer games, and why?

Client: I enjoy both single-player and multiplayer games for various reasons. Single-player games immerse me in compelling narratives and vast worlds where I can explore and progress at my leisure. They offer a personal and escape-oriented experience. Multiplayer games, conversely, bring a social element that enhances gameplay. Collaborating with friends or competing against others globally is highly enjoyable. Multiplayer titles foster connections and provide opportunities for teamwork and friendly rivalry.

Interviewer: That is wonderful! Moving on, would you say you are well versed in environmental issues?

Client: I may not be a professional in environmental matters, but I have a basic understanding of their significance and the need for sustainability. I believe it's essential for everyone to recognize our impact on the planet and take responsibility for preserving it for future generations. By making small changes like reducing waste, saving energy, and supporting environmental initiatives, we can collectively make a substantial difference. I strive to stay updated on environmental issues and incorporate sustainable practices into my daily routine wherever feasible.

Interviewer: Would you say you are well informed about something like environmental conservation?

Client: While I do have a basic understanding of environmental conservation, I wouldn't consider myself well-informed on the topic. However, I'm eager to learn more! Environmental conservation is such an important issue, and I believe it's crucial for everyone to be well-informed and actively engaged in finding solutions to protect our planet. I'm always open to learning more about ways to reduce our impact on the environment and promote sustainability in both my personal life and in broader contexts like gaming.

Interviewer: What would you like to see in a game that promotes awareness about environmental issues like protection of natural habitats?

Client: I think it would be cool for there to be a world filled with varying ecosystems, from vibrant forests to coral reefs and icy tundra’s. I’d love to get involved with hands-on tasks to protect the environment, like planting trees, removing pollutants from different waterways and rescuing endangered species from danger. I think it would be amazing to see a game that provides scientific knowledge in context to the game, so it doesn’t feel forced in.