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Problem Statement

Title of the Problem: AquaAegis – Defend, Restore, Sustain

Description

The degradation of global water ecosystems—rivers, lakes, seas, and oceans—severely threatens biodiversity, human livelihoods, and climate stability. Pollution, overfishing, illegal activities, and habitat destruction continue to jeopardize the health of these ecosystems. There is a need for awareness and education, especially among younger generations, about actionable steps to preserve water bodies and their ecosystems which can be achieved via games.

Context

Water ecosystems are the lifeblood of our planet, providing food, livelihoods, and ecological stability. However, growing threats such as plastic pollution, oil spills, and overexploitation of marine resources have pushed these ecosystems to the brink of collapse. Despite increasing global awareness, actionable solutions require an integrated approach combining education, strategic thinking, and engagement.

So, the main goal is to develop a game that educates people about ill effects of various human actions which are leading to replenishment of the water resources and urge the people to be a part of conserving the water bodies via strategic and critical thinking-based game to understand the situation much better and act quicker. Studies proved that gamified based learning paves a great path for higher involvement of individuals leading to greater impacts.

Literature Review

Title of the Paper

Game-Based Learning to Raise Awareness About Water Sustainability

Key Findings Relevant to the Problem

1. **Game-Based Learning's Effectiveness**:

   - Games, such as *Full Tank* and *Gram*, serve as engaging tools for raising awareness about water conservation.

   - Players gain insights into water usage and conservation through interactive scenarios.

2. **Real-Life Relevance**:

   - The games integrate everyday water-related activities into gameplay, helping players connect theoretical knowledge with practical applications.

- Scenarios include choices that lead to either water conservation or wastage, highlighting the impact of individual actions.

3. **Play-Based Learning Outcomes**:

   - Encourages students to observe, record, and reflect on water usage in their surroundings.

   - Enhances critical skills such as problem-solving, collaboration, and contextual understanding.

4. **Inclusivity and Scalability**:

   - Designed for simplicity and accessibility, games like *Full Tank* require minimal resources and are scalable for diverse audiences.

Gaps Identified in Existing Research

1. **Limited Long-Term Behavioral Impact**:

   - The research does not extensively assess whether learning through games results in sustained behavior changes over time.

2. **Audience Narrowing**:

   - Games primarily target children, with limited exploration of their impact on broader audiences like adults or policymakers.

3. **Lack of Contextual Adaptation**:

   - Existing games focus on generic scenarios rather than region-specific water challenges or localized issues.

4. **Depth of Engagement**:

   - Initial designs did not fully engage players with the broader context of their actions, focusing more on mechanics rather than the environmental significance.

Title of the Paper

Water Management Simulation Games and the Construction of Knowledge

Key Findings Relevant to the Problem

1. **Simulation Games as Educational Tools**:

   - Water management simulation games are effective in teaching complex concepts related to resource management.
   - These games create opportunities for experiential learning by allowing players to interact with and manage virtual water systems.

2. **Development of Key Skills**:

   - Games enhance critical skills such as teamwork, decision-making, and problem-solving.
   - Players better understand the long-term effects of their water management decisions.

3. **Holistic Perspective**:

   - By simulating real-world water management scenarios, games help players see the interconnections between social, economic, and environmental aspects of water management.

4. **Engagement Through Realistic Scenarios**:

   - Players experience the impact of choices, such as allocating water resources or mitigating drought effects, providing insights into sustainable practices.

Gaps Identified in Existing Research

1. **High Resource and Time Requirements**:

   - Developing and implementing simulation games is resource-intensive, limiting their scalability.

2. **Limited Audience**:

   - These games primarily target professionals and students in water management fields, leaving out broader demographics such as laypeople and younger audiences.

3. **Insufficient Integration of Theory**:

   - Many games fail to effectively incorporate theoretical frameworks, which can reduce their educational depth and impact.

4. **Lack of Long-Term Behavioral Studies**:

   - Research does not address whether players retain knowledge or change behaviors over time.

Title of the Paper

Research on the Cooperative Network Game Model of Marine Plastic Waste Management

Key Findings Relevant to the Problem

1. **Significance of Cooperation**:

   - Marine plastic waste pollution is a global crisis, threatening ecosystems and causing significant economic losses.

- Effective management of marine plastic waste requires global, regional, and national cooperative alliances.

2. **Economic Feasibility**:

   - The cooperative management model, supported by the "Myerson value" framework, demonstrates that collaboration can yield economic and ecological benefits.

3. **Influencing Factors**:

   - Factors such as capital investment, governance technology levels, and the amount of plastic waste significantly impact the stability and success of cooperative alliances.
   - Larger alliances are generally more effective, but an oversized alliance can reduce stability.

4. **Actionable Measures**:

   - Promoting technological innovation to enhance governance efficiency.
   - Implementing extended producer responsibility (EPR) policies to distribute management costs.
   - Establishing frameworks for equitable benefit sharing to maintain alliance stability.

   Gaps Identified in Existing Research

1. **Limited Scope of Analysis**:

   - The study focuses primarily on the economic perspective, neglecting cooperation's social, political, and cultural dimensions.

2. **Technological and Data Limitations**:

   - Current management technologies are inefficient and rely on traditional methods.
   - A lack of precise data on marine plastic waste distribution complicates governance.

3. **Challenges in Alliance Size**:

   - The impact of alliance size on stability is not fully understood, especially for large alliances.

4. **Long-Term Sustainability**:

   - Insufficient exploration of mechanisms to sustain cooperative alliances over extended periods.

Title of the Paper

Save the Ocean: A Game for Environmental Awareness

Key Findings Relevant to the Problem

1. **Educational Impact**: The game effectively teaches players about the recycling bin color system, improving awareness of selective waste collection.

2. **Awareness of Waste Harmfulness**: While some improvement was observed, the game's ability to educate players about the environmental harm caused by various waste types needs refinement.

3. **Engagement Through Gameplay**: Competitive elements, such as score-based mechanics and power-ups, successfully maintain player interest and reinforce environmental education.

4. **Preliminary Evaluation**: A study with 10 participants showed increased awareness of environmental issues after playing the game, particularly regarding the recycling system.

Gaps Identified in Existing Research

1. **Limited Scope of Awareness**: The study highlighted the need for better integration of information about the specific environmental impact of different waste types.

2. **Small Sample Size**: The evaluation involved only 10 participants, limiting the generalizability of the results.

3. **Focus on Short-Term Awareness**: The research does not address the game's long-term impact on behavior and environmental responsibility.

4. **Need for Advanced Gameplay Mechanics**: While the mechanics are engaging, they could be improved to better simulate real-world environmental challenges and solutions.

Title of the Paper

Save Our Sea: Game-Based Learning on Sea Environment Care

Key Findings Relevant to the Problem

1. **Effective Engagement**: The game effectively immerses players, fostering awareness and understanding of marine pollution issues.

2. **Educational Impact**: Through interactive gameplay across three levels (trash cleanup, oil spill management, and coral restoration), the game educates players on various environmental threats.

3. **Positive Emotional Response**: High scores in immersion and positive affect from the Game Experience Questionnaire (GEQ) indicate an engaging and impactful learning experience.

4. **Practical Learning**: Features like educational pop-ups and task-based gameplay encourage active participation and understanding of the consequences of marine pollution.

Gaps Identified in Existing Research

1. **Challenge Level and Flow**: Players reported moderate levels of challenge and flow, suggesting that the game could benefit from enhanced dynamics to sustain engagement.

2. **Limited Audience Accessibility**: The absence of multiple language options restricts the game's reach to diverse audiences.

3. **Scope for Technological Advancements**: The game lacks integration with modern technologies such as AR and VR, which could provide a more immersive educational experience.

4. **Focused Evaluation Sample**: The study primarily targeted young adults, indicating the need for broader demographic testing to generalize findings.

Applications and Media

Apps from Playstore

Name of the App

Water Battle – Grendel Games

Key Features and Functionalities

1. **Interactive Gameplay**

   - Combines platformer and puzzle elements to engage users in water-saving activities.
   - Players collaborate to earn diamonds and unlock additional levels.

2. **Water Consumption Tracking**

   - Tracks daily water usage using smart water meters or manual entry of readings.
   - Provides insights into water consumption patterns over time.

3. **Educational Component**

   - Offers tips, tricks, and quizzes to educate users about water conservation and the process of making drinking water.

4. **Savings Goals and Rewards**

   - Allows users to set and monitor water-saving goals.
   - Provides rewards (diamonds) for meeting goals, enabling continued gameplay.

5. **Community and Competition**

   - Weekly tournaments encourage collaboration and competition.
   - Users can aim to be weekly winners by saving water and earning points.

6. **Eco-Friendly Impact**

   - Promotes energy and water conservation to reduce ecological footprints.
   - Encourages conscious water usage to lower water bills.

7. **Partnership with Water Companies**

   - Offers extended features like real-time data tracking if the user's water company participates.
   - Water companies can collaborate to promote sustainable water use.

Limitations or Areas for Improvement

1. **Dependency on Water Company Participation**

   - Full features, such as real-time water tracking, are only available if the user's water company is involved, limiting accessibility for some users.

2. **Limited Game Variety**

   - The number of playable levels is restricted without meeting water-saving goals, which might demotivate casual players.

3. **Technical Challenges**

   - Relies on smart water meter integration, which may not be available to all users.

4. **Global Availability**

   - Features like tournaments and rewards may be localized and unavailable to users in regions without supporting water companies.

5. **Complexity for Non-Tech-Savvy Users**

   - Users unfamiliar with smart devices or water meters might face difficulties in fully utilizing the app's features.

Name of the App

Save Water SKDRDP(R) is a collaborative initiative supported by SKDRDP in partnership with the Karnataka government and UNICEF. The app is designed to promote water conservation through interactive challenges and educational content.

Key Features and Functionalities:

1. **Login and Authentication:**

   - Username and password login system.
   - Access to Karnataka Government's website, Facebook, and Instagram pages for information and updates.

2. **User Interface:**

   - **Kannada Translation**: Supports Kannada language for a more accessible experience for Kannada-speaking users.

3. **Challenges:**

   - **7 Available Challenges**: Includes activities like fixing leaky taps, controlling water flow, closing taps while brushing, and running washing machines with full loads.
   - **Challenge Categories**: Divided into easy, medium, and difficult levels.
   - **Duration**: Each challenge specifies duration in days.
   - **Water Savings**: Provides estimated water savings in liters/day and allows users to participate in challenges.

4. **Achievements:**

   - **Personal Achievements**: Tracks daily and monthly water savings (liters saved).
   - **Team Achievements**: Displays total water saved as a team and challenges completed on a daily/monthly basis.
   - **Download Certificate**: Allows users to download certificates for their achievements.
   - **Feedback and Edit Info**: Enables users to provide feedback and edit personal information.

5. **Leaderboard:**

   - Displays rankings based on individual and team performances.
   - **Days Streak**: Tracks streaks for completing challenges over 7 days.

6. **Signout and Language Options**:

   - Provides an option to sign out and allows users to switch languages between Kannada and other languages.

Limitations or Areas of Improvement:

1. **Privacy Concerns**:

   - Collects personal information, which may raise privacy concerns among some users.

2. **Device Compatibility**:

   - Performance may vary depending on the device and operating system, potentially affecting user experience.

3. **Feature Accessibility**:

   - Certain advanced features (like downloading certificates or accessing feedback) may require a stable internet connection.

4. **Challenge Customization**:

   - While challenges are detailed, some users may find that adding more challenge categories or providing more flexibility would enhance engagement.

5. **User Engagement**:

   - Continuous updates and interactive features could be improved for increased long-term user engagement.

Name of the App

World of Water – Star Fortune

Key Features and Functionalities:

1. **Unique Ocean Base**:

   - Players can develop and customize their Coral Reef habitat for deep-sea creatures.
   - Upgrade buildings, research evolutions, train troops, and build a marine environment of their choice.

2. **Match-3 Battles**:

   - Engage in relaxing yet strategic match-3 battles to eliminate puzzle pieces and defeat enemies.
   - Combines fun and strategic gameplay with the satisfaction of solving puzzles.

3. **Recruit Mysterious Heroes**:

   - Recruit powerful sea creatures known as Heroes, enhancing your journey through the ocean world.
   - Heroes serve as guardians and provide strategic advantages during battles.

4. **Strategy At Your Will**:

   - Various troop types and formations allow players to adapt their tactics to different enemies and situations.
   - Proper combinations of Heroes and troops enhance performance during battles.

5. **Global Cooperation**:

   - Join alliances with players from around the world to collaborate in battles and dominate the ocean realm.

- Participate in large-scale battles under alliance flags for enhanced strength and success.

6. **In-Game Support**:

   - Comprehensive help section available through in-game GM and dedicated communication channels (e.g., Facebook, Discord, Email).

Limitations or Areas of Improvement:

1. **Resource Management**:

   - The extensive need for resources may overwhelm players who struggle to manage inventory efficiently.

2. **Performance Issues**:

   - High-resolution graphics and extensive battle systems could lead to performance issues on lower-end devices.

3. **Monetization**:

   - In-app purchases are a significant part of the game, which could lead to a pay-to-win scenario for some users.

4. **Repetitive Gameplay**:

   - Repetitive tasks in resource management and troop upgrades may reduce long-term engagement for some players.

5. **Limited Offline Functionality**:

   - The game primarily relies on real-time online interactions, which may limit gameplay options when offline.

6. **Complex User Interface**:

   - For new players, the intricate user interface may pose a learning curve, which could deter initial engagement.

7. **Over-reliance on Internet Connectivity**:

   - The game heavily depends on internet connectivity for multiplayer battles and alliances, which may result in issues for players with inconsistent internet access.

Name of the App

Seabook: Fish Identifier

Key Features and Functionalities:

1. **Fish Identification**:

   - Instantly identify fish, sea creatures, corals, sponges, and plants with a comprehensive catalog of over 1,700 species.
   - Utilize advanced filters like color, pattern, location, body shape, and behavior to refine searches and improve accuracy.

2. **Dive Logbook**:

   - Track essential dive details such as date, time, depth, and location.
   - Record conditions like visibility, temperatures, water type, and current strength.
   - Include equipment details like wetsuit type, gas mix, tank specifics, and weights.
   - Document marine life sightings with easy-to-use selection and advanced filters.
   - Add personal notes and rate dives using a 5-star system to capture memories and experiences.

3. **Collections**:

   - Curate personal sea life collections by saving and organizing favorite species into custom albums for easy access and reference.
   - Cloud sync ensures all collections are backed up and accessible across devices for a seamless experience.

4. **Rich Encyclopedia**:

   - Comprehensive species information with captivating photos, descriptions, distribution, habitat, behavior, conservation status, and depth information.
   - Designed for both casual and professional divers, as well as marine biology enthusiasts.

5. **Direct Search**:

   - Quickly access detailed information on any marine species by entering its name directly into the search function.

6. **Offline Mode**:

   - Ideal for remote dives, liveaboards, or locations without internet access. Enables uninterrupted use of Seabook for identifying marine life.

7. **Advanced Features**:

   - Perfect for scuba divers, snorkelers, and marine biologists to enhance underwater experiences.
   - Document sightings of crabs, starfish, whales, and other species to enrich dive memories.

Limitations or Areas of Improvement:

1. **User Interface Complexity**:

   - Some users may find the interface overwhelming due to the abundance of features and options. Simplifying navigation could enhance usability.

2. **Offline Functionality**:

   - While Offline Mode is available, users may experience slower loading times or limited data access compared to online usage.

3. **Species Coverage**:

   - Although the catalog is vast, occasional updates and additions might be required to include new marine species or recent findings.

4. **Integration with Third-Party Apps**:

   - Enhancing compatibility with other diving or marine biology apps could create a more integrated experience for users.

5. **Performance on Low-End Devices**:

   - Devices with limited processing power may struggle with the app's high-resolution images and extensive data features.

6. **Technical Support**:

   - While in-app support is available, a more responsive customer service system or additional resources could improve the support experience.

Name of the App

Among Water: Relaxing Games

Key Features and Functionalities:

1. **Tranquil Fishing and Cat Companionship**:

   - Offers a serene escape with fishing adventures combined with the charm of feline companions.

2. **Anti-Stress and Relaxation**:

   - Integrates anti-stress elements, brain relaxing games, and anxiety relief features to create a peaceful atmosphere.

3. **Upgradable Ships and Advanced Fishing Equipment**:

   - Players can enhance their experience by upgrading ships and unlocking better fishing tools, offering more efficient gameplay.

4. **Adorable Cat-Inspired Landscapes**:

   - Allows players to navigate through cat-themed landscapes, with options to personalize characters in SEAL costumes for visual delight.

5. **Idle Tapping and Clicker Mechanics**:

   - Incorporates idle tapping and clicker game elements to provide a relaxing, repetitive gameplay loop that promotes stress relief.

6. **Incremental and Mindless Gameplay**:

   - Features incremental game mechanics that allow gradual progress and engaging, mindless activities for relaxation.

7. **Diverse Relaxation Quests**:

   - Offers various quests and challenges tailored for both adults and children, enhancing the charm of cat games along with nature games.

8. **Community and Social Interaction**:

   - Supports a community of players engaging in similar interests, promoting relaxation through shared experiences in a soothing environment.

Limitations or Areas of Improvement:

1. **Limited Game Variety**:

   - While the game focuses on relaxation, additional game modes or mini-games could diversify player experiences.

2. **Performance Issues on Low-End Devices**:

   - Idle tapping and clicker mechanics might cause performance issues on devices with limited processing power or memory.

3. **Repetitive Gameplay**:

   - For some players, the incremental and repetitive gameplay loop may become monotonous over time, requiring more interactive features.

4. **Customization Restrictions**:

   - While character customization is available, expanding customization options (e.g., more outfits or accessories) could enhance player engagement.

5. **Limited Real-time Interaction**:

   - Adding real-time interaction or multiplayer features could improve social aspects and engagement within the community.

6. **Frequent Updates for Content**:

   - Regular updates to introduce new content (e.g., new locations, fish species, or cat-themed designs) could sustain player interest and excitement.

Game Plan for *AquaAegis – Defend, Restore, Sustain*

A streamlined, meaningful 2D game designed within achievable constraints while addressing real-world issues effectively.

Core Design

- **Game Title**: *AquaAegis – Defend, Restore, Sustain*
- **Style**: **2D Top-Down Exploration**, where players control a submarine or diver to navigate and interact with the ocean environment from an overhead perspective, adapted to the ocean ecosystem theme.
- **Platform**: PC or Mobile, built with Unity.

Game Structure

Scene 1: Introduction (Opening Cinematic)

- **Duration**: 1-2 minutes.
- **Sequence**:

  1. Beautiful underwater and surface ecosystems, teeming with life.

  2. Gradual transition showing pollution, oil spills, plastic waste, and dead coral reefs.

  3. Voiceover/On-screen text:

     - *"Our water ecosystems are in peril. Join as a Guardian to Defend, Restore, and Sustain them."*

Scene 2: Combined Gameplay (Level 1 – Action Phase)

A single-level design combining **Pollution Cleanup**, **Oil Spill Management**, and **Coral Restoration** into a cohesive gameplay experience.

1. **Objective**:

   - Clean the ocean from plastics, manage an oil spill, and plant coral fragments to restore reefs.

2. **Gameplay Mechanics**:

   I. **Player Control**: Navigate a submarine (using WASD or arrow keys).

   II. **Plastic Collection**:

       a. Use a grappling hook or collector (spacebar or click) to pick up floating plastic.

       b. Score increases by sorting items into the correct bins (pop-up UI for guidance).

   III. **Oil Spill Cleanup**:

       a. Use a suction tool to absorb oil patches (hover over spills and press space).

       b. Each collected patch reduces marine life harm and boosts the score.

   IV. **Coral Restoration**:

       a. Reach coral reefs and drop coral fragments into highlighted restoration zones.

       b. Protect these zones by clearing debris or removing fishing nets.

3. **Challenges**:

   - Time limit to complete the level.
   - Random hazards (e.g., fish caught in nets, needing quick action to free them).

4. **Educational Prompts**:

   - Pop-ups between tasks with short facts:
     - Example: *"Plastic takes over 1000 years to decompose, affecting all marine life."*

Scene 3: Quiz and Learning Zone

1. **Objective**:

   - Test the player's knowledge about sea life, water ecosystems, and conservation practices.

2. **Quiz Structure**:

   I. Multiple-choice questions appear one by one with 3-4 options.

   II. Examples:

       a. *"Which material decomposes fastest in water: Paper, Plastic, or Metal?"*

       b. *"What is the largest coral reef system in the world?"*

   III. Correct answers earn points or badges.

3. **Interactive Learning**:

    I.   Include mini pop-ups after each quiz question with fascinating facts.

        a.   Example: *"Mangroves prevent 90% of coastline erosion and support marine life."*

4. **Optional Bonus Mini-Game**:

- Tap or click to uncover hidden marine species (e.g., turtles, seahorses) with brief facts about their ecological role.

Scene 4: Real-Life Action Tasks (Level 2 – Community Missions)

1. **Objective**:

- real-world engagement through simulated tasks that highlight actionable steps.

2. **Gameplay Mechanics**:

    Beach Cleanup:
- Players walk along a beach (side-scrolling) collecting trash with a simple drag-and-drop or tap mechanic.
- Bonus: Clearing the beach reveals turtle nests or other hidden biodiversity.
    Canal and Drain Cleaning:
- Players use a tool (hover and click) to clear blocked drains and canals, allowing water to flow freely.
- Clearing sections restores the visual appearance of the water (e.g., from polluted to clean).

3. **End Scene**:

- Display before-and-after visuals showing the improved environment after the player's actions.
- A pop-up reads:
  "What you've done here can be done in real life. Join local cleanups, reduce waste, and protect water ecosystems!"

Core Features and Tools

1. **Tools for Development**:

- Unity 2D Engine for side-scrolling mechanics.
- Free asset libraries for marine objects, pollution items, and underwater backdrops. (Will be collected online in the form of PNG).

2. **Art and Audio**:

- Minimalist sprites for the submarine, trash, and marine life using tools like Aseprite and Canva.
- Simple background music with underwater and nature sound effects.

3. **User Engagement**:

- Reward system (badges for levels completed).
- Link to resources for real-world action (e.g., WWF, Greenpeace).

4. Websites explored:

- https://craftpix.net/
- https://olgas-lab.itch.io/underwater-background
- Itch.io

Key Design Principles

1. **Accessibility**:

- Simple controls (WASD, spacebar, mouse clicks).
- Intuitive UI and tutorials for new players.

2. **Education Through Action**:

- Use brief facts during gameplay to educate players without overwhelming them.

3. **Replayability**:

- Dynamic levels (e.g., changing trash placement, random obstacles).

4. **Real-World Connection**:

- Highlight achievable steps players can take in their daily lives to protect ecosystems.

<u>How AquaAegis Differs or Improves Upon Existing Solutions</u>

1. Combination of Realism and Gamification:

   o Unlike most educational games, *AquaAegis* integrates real-world problem-solving tasks (e.g., plastic cleanup, oil spill management, and coral restoration) into engaging gameplay, emphasizing practical, actionable steps.

   o It combines multiple environmental issues into one cohesive experience, unlike existing games that focus on single aspects like recycling or water conservation.

2. Real-life Impact Inspiration:

   o *AquaAegis* motivates players to take real-world actions, such as beach cleanups and sustainable living, by simulating these tasks in its levels.
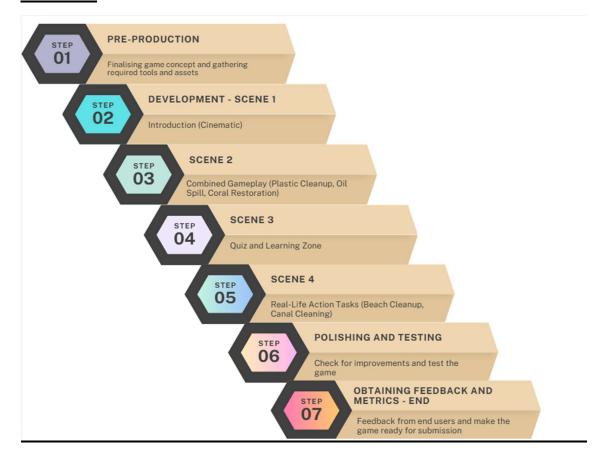
- o   Pop-up educational prompts connect in-game actions to real-world facts, making learning meaningful and actionable.

3. Inclusivity and Accessibility:

- o   Simple mechanics (top-down exploration, drag-and-drop, and quizzes) make it suitable for all age groups, from kids to adults.

- o   Multilingual support and interactive tutorials ensure a wide reach.

4. Interactive Learning through Quizzes and Facts:

- o   The quiz-based learning zone is integrated seamlessly, providing players with a chance to test their knowledge and learn new concepts while playing.

- o   Fascinating facts are delivered during gameplay, increasing retention and engagement.

Details of Data Sources, Tools, Algorithms, and Frameworks

Data Sources

1. Environmental Information:

- o   Research papers, reports from WWF, UNEP, and similar organizations for accurate facts.

- o   Open-access educational content on marine biodiversity and pollution statistics.

2. Inspiration from Similar Games:

- o   Study mechanics and educational methods used in *Save the Ocean*, *Water Battle*, and other referenced apps to identify gaps and refine features.

Workflow

Workflow diagram showing seven steps:
- **STEP 01 – PRE-PRODUCTION**: Finalising game concept and gathering required tools and assets
- **STEP 02 – DEVELOPMENT - SCENE 1**: Introduction (Cinematic)
- **STEP 03 – SCENE 2**: Combined Gameplay (Plastic Cleanup, Oil Spill, Coral Restoration)
- **STEP 04 – SCENE 3**: Quiz and Learning Zone
- **STEP 05 – SCENE 4**: Real-Life Action Tasks (Beach Cleanup, Canal Cleaning)
- **STEP 06 – POLISHING AND TESTING**: Check for improvements and test the game
- **STEP 07 – OBTAINING FEEDBACK AND METRICS - END**: Feedback from end users and make the game ready for submission

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Timeline for development (Work breakdown structure)

Week 1: February 2 - February 8

Goal: **Planning, Setup, and Core Mechanics**

- **Day 1–2**:
  - Finalize game concept and mechanics.
  - Define game scenes, objectives, and controls.
  - Prepare a detailed list of assets required (submarine, marine life, trash, etc.).

- **Day 3–4**:
  - Set up Unity project and organize folders.
  - Implement basic movement for the submarine/diver (WASD or arrow keys).

- **Day 5–7**:
  - Build the core mechanic: trash collection (grappling hook, suction, etc.).
  - Implement sorting of items into correct bins (basic UI for recycling).

Week 2: February 9 - February 15

Goal: **Oil Spill Cleanup and Coral Restoration**

- **Day 8–10**:

    - Develop oil spill cleanup mechanic: suction or collection tool.
    - Implement oil spill hazards (marine life affected, urgent cleanup needed).

- **Day 11–13**:

    - Add coral restoration mechanic: drag-and-drop for planting coral fragments.
    - Design coral restoration zones in the game.

- **Day 14**:

    - Test and refine Level 1 (Plastic cleanup, Oil Spill, Coral Restoration) mechanics.

Week 3: February 16 - February 22

Goal: **Quiz System, Learning Zone, and Real-World Tasks**

- **Day 15–16**:

    - Implement a quiz system for marine life and conservation facts (multiple-choice format).
    - Add fact pop-ups after each level to educate players.

- **Day 17–19**:

    - Develop real-world task-based levels (beach cleanup, canal cleaning).
    - Set up interactive tasks like clearing trash, fixing drains, etc.

- **Day 20–21**:

    - Add animations or simple effects for cleaned zones (e.g., trash disappearing, water clearing).
    - Ensure transitions between tasks are smooth and educational prompts are present.

Week 4: February 23 - March 1

Goal: **Polishing and Integration**

- **Day 22–23**:

    - Refine gameplay mechanics (movement, task interaction).
    - Integrate sound effects and background music for an immersive experience.

- **Day 24–25**:

    - Add visual polish: backgrounds, UI, minor animations.

- Test the transition between quiz and tasks, ensuring the flow feels natural.
- **Day 26–27**:
  - Focus on the user interface: ensure it's clean and easy to navigate.
  - Refine the game's visual elements (trash, coral, UI elements).

Week 5: March 2 - March 8

Goal: **Finalization and User Testing**

- **Day 28–29**:
  - Perform internal testing: Play through all levels, fix bugs, and ensure smooth gameplay.
  - Gather feedback from a few people (friends, peers).
- **Day 30–31**:
  - Implement feedback and make necessary improvements (difficulty adjustments, level balancing).
  - Finalize scoring system and reward mechanism.

Week 6: March 9 - March 12

Goal: **Deployment and Presentation**

- **Day 32**:
  - Final bug fixing and testing.
  - Export the game for the desired platform (PC or Web).
- **Day 33**:
  - Prepare a small presentation or documentation on the game (for project submission).

Milestones:

1. **February 8**: Core mechanics (movement, trash collection, oil spill, coral restoration) completed.

2. **February 15**: Quiz system and real-world tasks ready.

3. **March 1**: Game polishing and UI integration finished.

4. **March 8**: Completed testing and feedback implementation.

5. **March 12**: Game ready for presentation.

Parameters for Performance Assessment

Evaluation Metrics

1. **Usability**:

   - **Player Feedback**: Gathering player satisfaction scores using a post-game survey.

   - **Ease of Navigation**: Measuring how intuitively players can complete tasks like trash collection or oil spill cleanup without assistance.

2. **Engagement**:

   - **Session Duration**: Tracking the average time players spend in the game.

   - **Task Completion Rate**: Monitor the percentage of players who complete all levels or tasks.

3. **Educational Impact**:

   - **Knowledge Retention**: Usage of pre- and post-quiz scores to measure the increase in player knowledge about water ecosystems.

   - **Behavioral Intent**: Including survey questions asking players if they're motivated to take real-life action after playing the game.

4. **System Performance**:

   - **Response Time**: Ensuring smooth gameplay by measuring load times for transitions between levels and interactions.

Comparison Baseline

1. **Benchmarks**:

   - Comparison of engagement and usability with other educational games like *Save the Ocean* or *Save Water SKDRDP*.

   - Use metrics from similar environmental awareness games to evaluate knowledge retention (e.g., quiz performance or learning outcomes).

2. **Existing Solutions**:

   - Comparing the game's educational effectiveness with traditional methods (e.g., reading articles or watching videos).

   - Assess the motivational impact of *AquaAegis* against apps like *Water Battle* that use gamification for conservation.

Expected Outcomes

1. **Usability Success**:

   o Players rate the game at least **4/5** for ease of use and enjoyment in surveys.

   o 80% or more players can complete tasks without needing tutorials after the first level.

2. **Engagement Goals**:

   o Average playtime per session is at least **15 minutes**.

   o At least 60% of players complete all levels, including the quiz and real-life task-based levels.

3. **Educational Impact**:

   o Pre- and post-quiz comparisons show a **30% or higher increase** in knowledge scores.

   o 50% of players indicate willingness to participate in real-life conservation activities.

4. **Technical Performance**:

   o Response time for level transitions and interactions is less than **2 seconds**.

   o Game runs smoothly at **30-60 FPS** on mid-range devices.

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