

Snappers. Aadi, Jhanvi, & Laura.

The Problem Space:

Our VR experience, Rising Tides, reveals the critical role of coral in marine ecosystems and the impact of climate change on atoll islands. Using engaging storytelling and interactive features, users navigate a jet ski through the Maldives, Tuvalu, and the Marshall Islands—three islands identified by the UN as most at risk from rising sea levels (published, 2023).

Coral reefs are essential for creating the sand that shores need to grow and withstand waves. This VR experience highlights the interconnectedness of sea level changes and coral reef sedimentation, teaching users about coral bleaching. When seawater temperatures increase by just 1°C for four weeks, coral polyps expel their vibrant algae, revealing their white skeletons and leading to their starvation and death (Great Barrier Reef Foundation, 2016). In March, the Great Barrier Reef experienced its fifth mass bleaching event (Great Barrier Reef Foundation, 2016). The decline of coral populations endangers numerous small island nations as atoll islands struggle to keep pace with rising sea levels due to declining coral populations.

In the United Nations 2009 summit, the president of the Maldives stated, “you know that with a sea-level rise of over 1.5 meters, hundreds of millions of people would be dead. They would simply be wiped out” (United Nations, 2020). Even though these small island nations contribute nothing to climate change, they will feel the brunt of its effect.

Prototype Description:

In this immersive experience, users pilot a jet ski through three islands: Tuvalu, Marshall, and the Maldives. They view the journey in first-person and control animated hands via their headset controllers for added immersion. As they pass each island, a narrator explains climate change's impact on coral populations. The islands cover distinct topics: the Maldives' corrects misconceptions about coral being an animal, while en route to the second island, users learn about coral's role in sand production. Upon reaching Tuvalu, the threat to atoll islands is clarified, emphasizing the sinking due to coral bleaching. At the Marshall Islands, users are prompted to throw coral into the water, witnessing the reef's growth and connecting coral health to island erosion in a gamified format.

The Design Process:

Our design process began with a comprehensive survey aimed at identifying knowledge gaps among users. We discovered that many were unaware of the impact of climate change to atoll islands and did not realize that coral is an animal or its vital role in the marine ecosystem. Additionally, we found that our users preferred to learn through storytelling and gamified features. To explore our target demographic further, we created user personas to identify key pain points and attributes of our user.



QUOTE:

"I've always been passionate about the environment and way to conserve and restore in the marine wildlife" While I'm aware of climate change and its global impact, I only know a little bit about the effects on the atoll islands. I love learning the stories and engaging dialogues in VR."

JENNIFER WU

Age: 31

Location: Sydney, NSW

Occupation: Environmental scientist at WWF

Gender: Female

BACKSTORY

Jennifer lives in Sydney, New South Wales. In her role as an environmental scientist, she leads various marine conservation projects aimed at protecting Australia's unique marine biodiversity. During her free time, she is goes scuba diving and loves underwater photography, using her stunning photos to raise awareness about marine conservation. She is also actively involved in her local community, leading beach clean-up events and giving talks at schools to inspire the next generation of environmental stewards.

IDEAL EXPERIENCE / GOALS / ASPIRATIONS / FEELINGS:

Jennifer wants more initiative taken by the wider community to take action and spread awareness about effects of coral reefs on sea levels in relation to climate change.



Jennifer is unhappy and confused

FRUSTRATIONS

Balancing her work, outdoor activities, and advocacy efforts for coral reef habitat in relation to climate change leaves Cherry feeling unhappy and confused, as she cannot find time to address the issue.

Cherry feels frustrated by the limited impact she is able to make in addressing the complex challenges facing the climate change impact on coral reefs in effecting rising sea levels, and is eager to learn more.

With our problem-space and users identified, we began sketching to ideate. Selected concepts were then iterated in storyboarding exercises, to generate different narratives and flows of the experience. A user journey map was created to understand the plot points and emotions, ensuring a cohesive and engaging experience. Finally, wireframes were created to allow the team to visualise and refine our VR concept further.

During development, we encountered significant challenges in loading the experience onto the PICO headsets. A significant amount of time was spent debugging and troubleshooting. This significantly set back our development process, as we lost days trying to resolve the issue, which hindered the refinement of the experience.

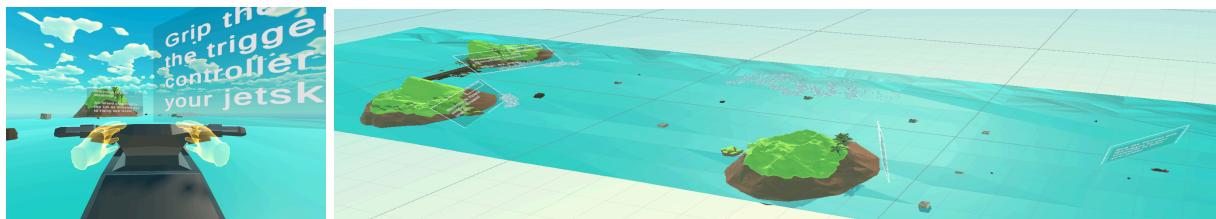
Despite these setbacks, testing and interviews provided valuable insights. Our testing, unfortunately, had to be conducted using the VR simulator due to our technical challenges. From our testing, we found that users loved the jet ski element. Yet, suggested adding music and realistic motor sounds for better immersion. They also suggested enhancing the connection to the coral environment by incorporating coral reef assets throughout the ocean. Feedback from think-aloud sessions prompted us to adjust the text and background elements for better usability and engagement. We added a script to trigger a fade-in/out effect for the text, ensuring it didn't obstruct the user's visibility. Additionally, we placed the text within the environment rather than directly in the user's field of view, in line with VR design principles.

Our experience underwent a pivot in concept as a majority of our users found the steering mechanics of the jetski too difficult and hard to understand. To iterate our concept, we took inspiration from "on-track" experiences where the player can only move in one direction. The environment, assets and interactive features are then built around this 'track' for the user to experience. This shift allowed us to maintain the immersive elements while simplifying navigation, ensuring users could focus on the educational content without frustration.

The transition to an on-track experience significantly improved user engagement and comprehension. By streamlining movement, we were able to better integrate educational narratives about coral ecosystems and climate change impacts. This design decision not only enhanced the overall user experience but also reinforced our educational goals.



Iteration 1



Iteration 2

Our design process evolved research, user-focused ideation, and iterative development, ultimately crafting a VR experience that bridges the knowledge gap about climate change's impact on coral ecosystems and atoll islands. By leveraging user insights and preferences for storytelling and gamified learning, we developed an immersive and educational journey. Despite significant technical challenges, our testing allowed us to refine and enhance the experience's usability and immersion. The result is a compelling VR experience that educates users on coral's critical role in marine ecosystems and the broader implications of climate change. This project highlights the importance of emerging technologies, user-centered design, and adaptive problem-solving in creating impactful educational experiences.

Future Work & Current Bugs:

To further enhance our experience, we could introduce an interactive coral bleaching feature. Users could grab and throw coral into the ocean, changing its color from white to vibrant hues as they restore the reef's health. Additionally, pressing a button on the jet ski's radio or a walkie-talkie could trigger the narrator's audio, allowing users to listen to the captain's monologue at their own pace.

Currently, a bug causes the coral to appear offset from the controller when grabbed, disrupting the realism. Additionally, the gripping mechanic is configured to the left controller instead of the right. Moreover, we have been unable to load the experience onto the PICO headset, significantly hindering our project's progress.

Team Evaluation:

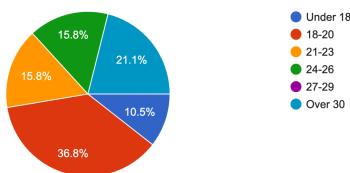
Overall despite all the challenges and setbacks that we have faced, we wanted to continue with our chosen idea, the coral habitat and production and embrace its uniqueness, in relation to the strong impact on rising sea levels. We put in our full efforts in making sure this is an immersive experience and engaging user interaction in a virtual environment. By iterating and evaluating along the process, it allowed us to create a prototype that is more intuitive and functional for the user. In addition our journey with Unity not only expanded our technical skills but also deepened our understanding of virtual environment development and interactive storytelling.

Appendix:

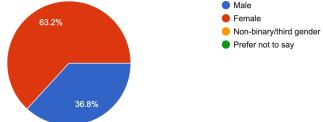
UX Testing:

Survey: <https://forms.gle/Sm6LhVsG4fiw6MQj9>

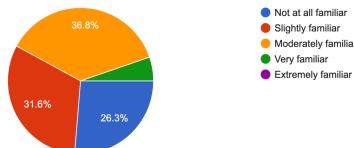
What is your age?
19 responses



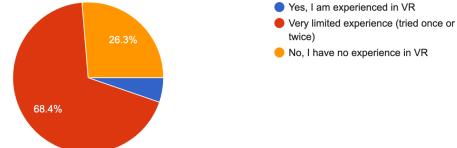
What is your gender?
19 responses



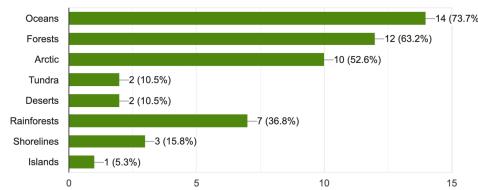
What is your level of familiarity with virtual reality gaming?
19 responses



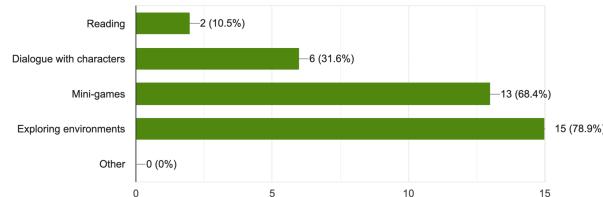
Have you had any prior experience in a VR environment?
19 responses



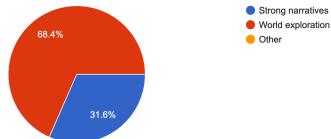
What type of environment do you associate most with the impact of 'climate change'?
19 responses



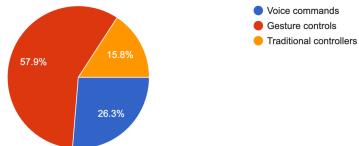
How do you prefer to learn in a VR environment? (Select all that apply)
19 responses



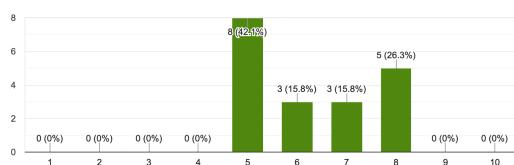
Do you prefer educational games with strong narratives or open-world exploration?
19 responses



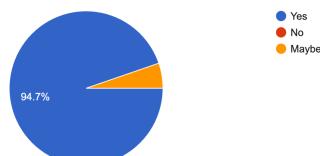
What control method would you prefer for interacting with the game?
19 responses



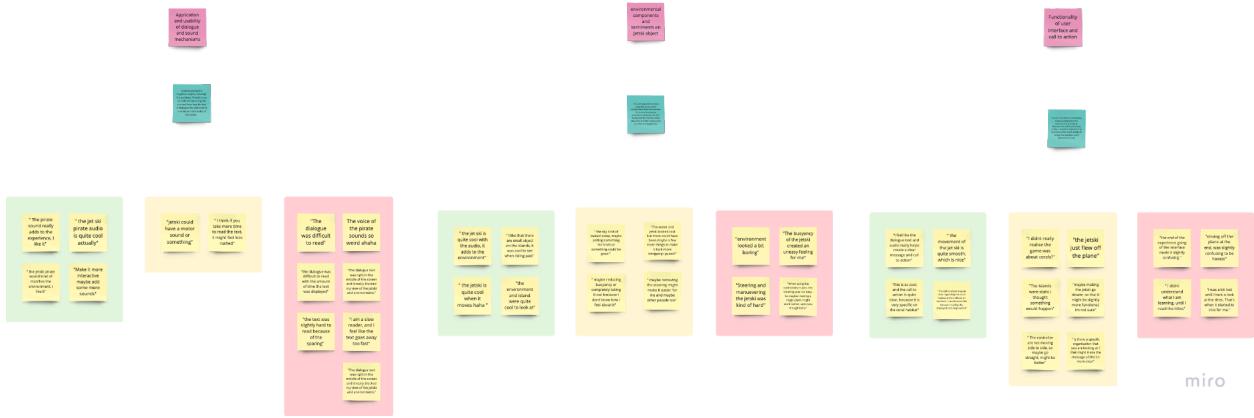
On a scale of 1 to 10, how much do you know about the effects of climate change on various habitats/environments?
19 responses



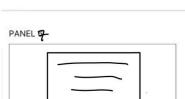
Would you be interested in exploring virtual representations of Arctic landscapes and wildlife?
19 responses



Affinity Diagram:



Story Board:

TITLE		VR STORYBOARD	PAGE	OF
NAME		YEAR & SUBJECT	DATE	
PANEL 1				
 <p>Woo hoo we're here! Let's go see what adventures we have in store!</p>		 <p>Arrived at our first destination!</p>		
(INTRO)		(ISLAND #1)	(DESCRIPTION)	
PANEL 4				
 <p>We have reached our first island!</p>		 <p>Island #1</p>		
(ISLAND #2)		(DESCRIPTION)	(ISLAND #3)	
PANEL 7				
				
(DESCRIPTION)		(DESCRIPTION)		

User Personas:



QUOTE:

"I've always been passionate about the environment and way to conserve and restore in the marine wildlife." While I'm aware of climate change and its global impact, I only know a little bit about the effects on the atoll islands. I love learning the stories and engaging dialogues in VR."

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IDEAL EXPERIENCE / GOALS / ASPIRATIONS / FEELINGS:

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FRUSTRATIONS

Balancing her work, outdoor activities, and advocacy efforts for coral reef habitat in relation to climate change leaves Cherry feeling unhappy and confused, as she cannot find time to address the issue.

Cherry feels frustrated by the limited impact she is able to make in addressing the complex challenges facing the climate change impact on coral reefs in effecting rising sea levels, and is eager to learn more.



QUOTE:

"I'm really into gaming during my free time, especially PC games. Lately, I've also discovered a new fascination with VR games. After school, I often go skateboarding with my friends around Mascot and Redfern in Sydney. I'm eager to learn more about this, especially how VR can be used to represent these habitats."

CHARLIE STEEL

Age: 19

Location: Sydney, NSW

Occupation: Student

Gender: Male

BACKSTORY

Charlie lives in Mascot, Sydney around the Redfern area. He lives with his parents and 2 younger sisters. Charlie enjoys gaming during his free time, including regular PC games, and recently has found a new fascination with VR games. After school, Charlie frequently goes skateboarding with his friends. He knows a lot about climate change but never considered low-land regions impact and destruction of habitability for island nations. He is eager to learn more about this and how VR interactions can be shown to represent this habitat.

IDEAL EXPERIENCE / GOALS / ASPIRATIONS / FEELINGS:

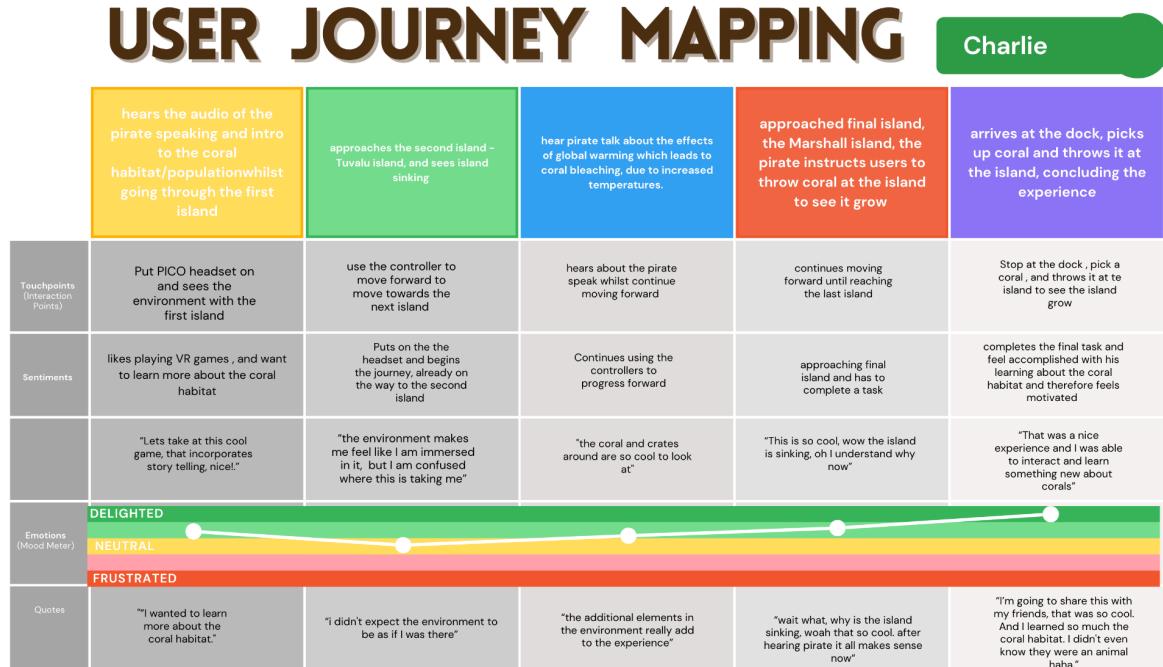
Charlie wants to become more knowledgeable about the effects of climate change on low-land regions, particularly the habitability of island nations. He seeks an interactive learning experience that allows him to explore and understand these vulnerable habitats. Charlie aspires to share this knowledge with his friends, hoping to get them interested in the importance of climate awareness and the conditions of island nations. He hopes to one day have the same experiences with his friends and can help take action on this issue. He feels that this issue should be addressed in a manner where students can have fun whilst learning about an issue.

FRUSTRATIONS

Charlie feels disappointed that his friends don't show the same level of interest or engagement in learning low-land regions impact and destruction of habitability for island nations.

Limited access to resources and educational material about the coral reef habitat and islands, Charlie wants to explore his newfound passion further.

User Journey map:



Assets, Audio & Scripts

Assets:

Jetty, Barrels & Crates Package:

Low Poly: Woods Lifestyle | 3D Wooden Assets | Unity Asset Store. (n.d.). Assetstore.unity.com.

<https://assetstore.unity.com/packages/3d/environments/low-poly-woods-lifestyle-65306>

Water Package:

LowPoly Water | Particles/Effects | Unity Asset Store. (n.d.). Assetstore.unity.com.

<https://assetstore.unity.com/packages/tools/particles-effects/lowpoly-water-107563>

Boats + Jetski Package:

Boats - PolyPack | 3D Sea | Unity Asset Store. (n.d.). Assetstore.unity.com.

<https://assetstore.unity.com/packages/3d/vehicles/sea/boats-polypack-189866>

Low- poly nature trees:

Low-Poly Style Nature. (2016). @UnityAssetStore; Unity Asset Store.
<https://assetstore.unity.com/packages/3d/environments/low-poly-style-nature-66322>

Palm trees:

Free Trees | 3D Trees | Unity Asset Store. (n.d.). Assetstore.unity.com.
<https://assetstore.unity.com/packages/3d/vegetation/trees/free-trees-103208>

Island base:

JustCreate. (2023). | Low Poly Tropical Island Lite | [Unity Asset]. Unity Asset Store.
<https://assetstore.unity.com/packages/3d/environments/low-poly-tropical-island-lite-242437>

Sky:

Free Stylized Skybox | 2D Sky | Unity Asset Store. (n.d.). Assetstore.unity.com.
<https://assetstore.unity.com/packages/2d/textures-materials/sky/free-stylized-skybox-212257>

Gleechi-hands:

Gheechi Hand Free (VR) | VFX Shaders | Unity Asset Store. (n.d.).
<https://assetstore.unity.com/packages/tools/utilities/virtualgrasp-hand-poser-test-version-240823>

Coral Model:

Coral tree | CGTrader. (n.d.). www.cgtrader.com. Retrieved May 30, 2024, from
<https://www.cgtrader.com/items/3977413/download-page>

Pointer/Arrow Model:

Red Arrow Chevrons Wayfinding - Download Free 3D model by ironandsilk. (2018, August 8). Sketchfab.com.
<https://sketchfab.com/3d-models/red-arrow-chevrons-wayfinding-aa360fe27a854420955a8920d4c45198>

Audio:

Jetski noise:

Sound FX. (2023, January 5). Jet Ski Sound Effect | Jetski Noise On Water Audio - Free Download in Description. YouTube. <https://www.youtube.com/watch?v=YDfN2Og9NFo>

Sea captain soundboard:

Horatio McAllister - Sea Captain TTS Computer AI Voice. (2023, March 2). 101soundboards.com — Have Fun Playing Sound Clips.
<https://www.101soundboards.com/boards/77273-horatio-mcallister-sea-captain-tts-computer-ai-voice>

Music:

[no copyright music] “Dreamy Mode” cute background music. (n.d.). www.youtube.com.
<https://www.youtube.com/watch?v=hCtwi8XkB4o>

Scripts:

Buoyancy:

How to make objects float on water in Unity. (n.d.). Stack Overflow. Retrieved May 30, 2024, from <https://stackoverflow.com/questions/69959062/how-to-make-objects-float-on-water-in-unity>

References:

1. East, H. K., Perry, C. T., Kench, P. S., Liang, Y., & Gulliver, P. (2018). Coral Reef Island Initiation and Development Under Higher Than Present Sea Levels. *Geophysical Research Letters*, 45(20).
<https://doi.org/10.1029/2018gl079589>
2. Great Barrier Reef Foundation. (2016). Coral Bleaching. Great Barrier Reef Foundation.
<https://www.barrierreef.org/the-reef/threats/coral-bleaching#:~:text=increased%20UV%20radiation.->
3. published, M. D. (2023, November 12). Which islands will become uninhabitable due to climate change first? Livescience.com.
<https://www.livescience.com/planet-earth/climate-change/which-islands-will-become-uninhabitable-due-to-climate-change-first>
4. United Nations. (2020). Small Islands, Rising Seas | United Nations. Un.org; United Nations.
<https://www.un.org/en/chronicle/article/small-islands-rising-seas>