Plastic Extermination

Life Below Water: A Virtual Reality Experience

Michelle Nguyen
Undergraduate Student, Graphic Design Major, University of Illinois Chicago

Justin Lawrence
Undergraduate Student, Graphic Design Major, University of Illinois Chicago

Gene Jolivet
Undergraduate Student, Graphic Design Major, University of Illinois Chicago

Ashir Saleemi
Undergraduate Student, Computer Science Major, University of Illinois Chicago

ABSTRACT:

Ocean pollution is a serious environmental problem that is almost often caused by human activities. Common pollutants include oil spills, chemicals, and plastic waste. These specific pollutants harm marine life, damage ecosystems, and risk human health through contaminated seafood. The accumulation of plastic debris, more specifically, is a huge issue, impacting marine animals and habitats. We can change the outcome with efforts to address the plastic pollution in the ocean by introducing a Virtual Reality (VR) experience designed to immerse users in the intricate challenges of ocean pollution, more specifically, plastic waste. Leveraging VR technology, the user will embark on a journey to explore a heavily polluted habitat, encountering the devastating impact of plastic waste and trash pollution. This experience aims to create a deeper understanding of oceanic threats. By combining educational content and a compelling narrative within this VR environment, this project seeks to inspire awareness and sustainable actions to address the urgent issue of ocean pollution.

INTRODUCTION:

Our Group was tasked with creating a VR simulation based on the sustainable goal number 14: Life Below Water. The "Life Below Water" sustainable goal, as outlined by the United Nations in their Sustainable Development Goals (SDGs), is a crucial initiative aimed at conserving and sustainably using the oceans, seas, and marine resources. With marine ecosystems facing unprecedented challenges such as pollution, overfishing, and climate change, this goal seeks to promote the responsible management and protection of marine life. One of the primary objectives is to prevent and significantly reduce marine pollution, including plastic debris and nutrient runoff. The impact of such pollution on marine life and ecosystems is profound, affecting not only the biodiversity of underwater habitats but also threatening the livelihoods of communities dependent on marine resources. We have chosen to specifically focus on the issue of plastic pollution and its detrimental impact on marine life within our VR simulation.The user will navigate through an immersive underwater environment, where their objective is to engage in the cleanup of ocean debris. This interactive experience involves the responsible disposal of waste into designated bins, fostering an awareness of the challenges associated with plastic pollution and encouraging participants to actively contribute to environmental preservation.

RESEARCH:

Plastic pollution in the oceans has reached alarming levels, driven primarily by inadequate waste management, irresponsible disposal practices, and the persistence of single-use plastics. Plastic and trash pollution have many detrimental environmental consequences. Marine life, from the smallest organisms to the largest mammals, faces the threat of entanglement, ingestion, and habitat degradation. The accumulation of plastic particles in the water column and sediments further disrupts ecosystems, with potential cascading effects on food webs and biodiversity. The sources of plastic pollution are diverse, ranging from land-based activities such as improper waste disposal to industrial runoff and shipping accidents. Single-use plastics, including bottles, bags, and packaging materials, constitute a significant portion of marine debris. The pathways by which plastics enter the oceans are complex, involving rivers,

wind transport, and direct disposal from ships. Addressing plastic and trash pollution requires a multi-faceted approach. Effective waste management, reduction of single-use plastics, and international collaboration for policy development and enforcement are integral components of a comprehensive solution. Innovation in recycling technologies, public awareness campaigns, and corporate responsibility initiatives also play pivotal roles in mitigating the impacts of ocean pollution. Plastic and trash pollution in the oceans demand urgent attention and concerted global action. Through informed decision-making, responsible consumption, and innovative solutions, humanity can forge a path towards a sustainable and healthier future for our oceans.

SOLUTION:

Addressing plastic and trash pollution through effective recycling strategies is essential for mitigating the environmental impact. In the context of our VR simulation, recycling assumes a pivotal role as a primary strategy for mitigating the plastic and trash pollution issue. Also, the use of typographical elements creates a murky environment in the beginning, and a clean one in the end. Upon completion of the environmental cleanup phase, users will receive prompts to systematically dispose of the collected debris into designated bins. This immersive experience is strategically designed to impart a nuanced understanding of the critical significance of recycling in fostering the well-being of marine life.

IDEATION AND STORY BOARD:

Initially, our group started with a static environment underwater where the user was tasked with both cleansing the surroundings and intercepting falling debris before marine life could ingest it.. After a proper evaluation, it became evident that the limited interactivity and static nature of the environment lacked the proper engagement to effectively convey our intended message.

In our revised storyboard, we addressed the issues identified in the initial concept, specifically increasing the level of engagement by introducing a more dynamic environment. The user will be presented with a scenario requiring them to navigate through a typographic debris, peaking in the rescue of a distressed turtle entangled in plastic. Following this pivotal moment, the user seamlessly transitions to the retrieval of the typographic debris, ultimately progressing through a tunnel that leads to the surface. The narrative then provided the user with the opportunity to responsibly dispose of the accumulated trash and debris into designated bins, aligning with the overarching objective of fostering environmental awareness and active participation.

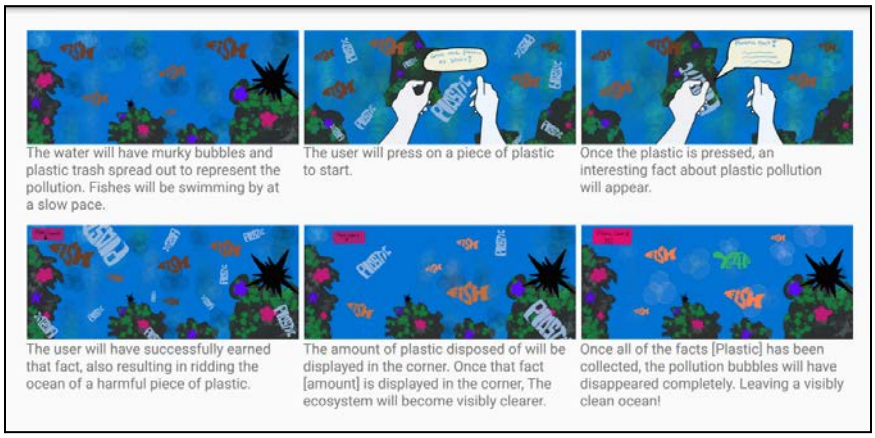

Figure 1. Show our storyboard of our initial proposal for out project with detailed descriptions of each scene

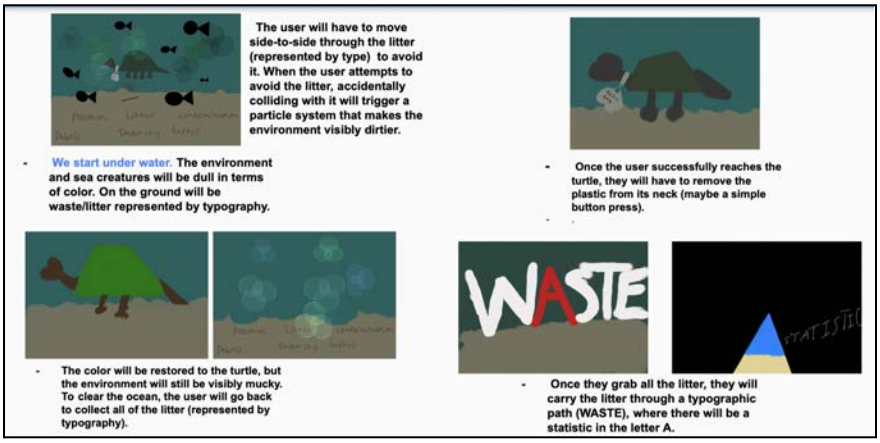

Figure 1.2 Show our revised and final storyboard

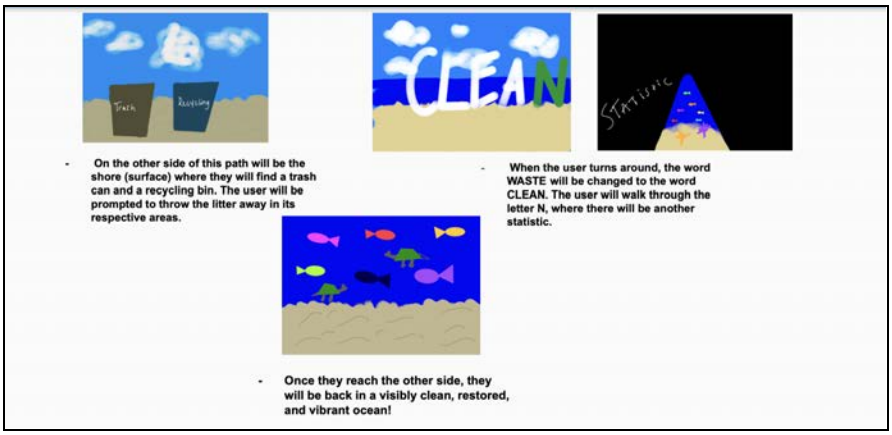

Figure 1.3 Show a continuation our revised and final storyboard

CHALLENGES:

- Our first challenge was figuring out our interactions. We knew that we needed a set amount in order to create an immersive experience. Once we got deeper into the semester, and had the chance to take a look at other projects similar to ours, we were able to come to a better understanding of what it was that we needed to include to make our project solid.

- Our second challenge was understanding unity, and using it to our advantage. Unity is a complicated software, and it was completely new to the graphic designers in the group. We learned that asking questions, and quick tutorials were very helpful for us.

- The final challenge that we faced was our below average frame rate. Our project's frame rate ran at 50 to 60 fps, Ideally we needed to increase the rate to a constant 100 fps or higher. Our first attempt was going through our terrain and began reducing the numbers of objects one by one. We soon found that the problem was the resolution of all of our typographic elements and certain objects. We were able to overcome this challenge by compressing all of the objects, audio files, and optimizing certain codes. Another change that helped increase our frame rate was lowering the resolution of all our textures. Some of our objects had rough textures that had very high

resolution that drastically limited our project's frame rate. By reducing the textures to 128 bits, we were able to increase our frame rate to a constant 160 to 170 frames per second.

Figure 2 shows two students in the CAVE2™ Environment exploring the project.

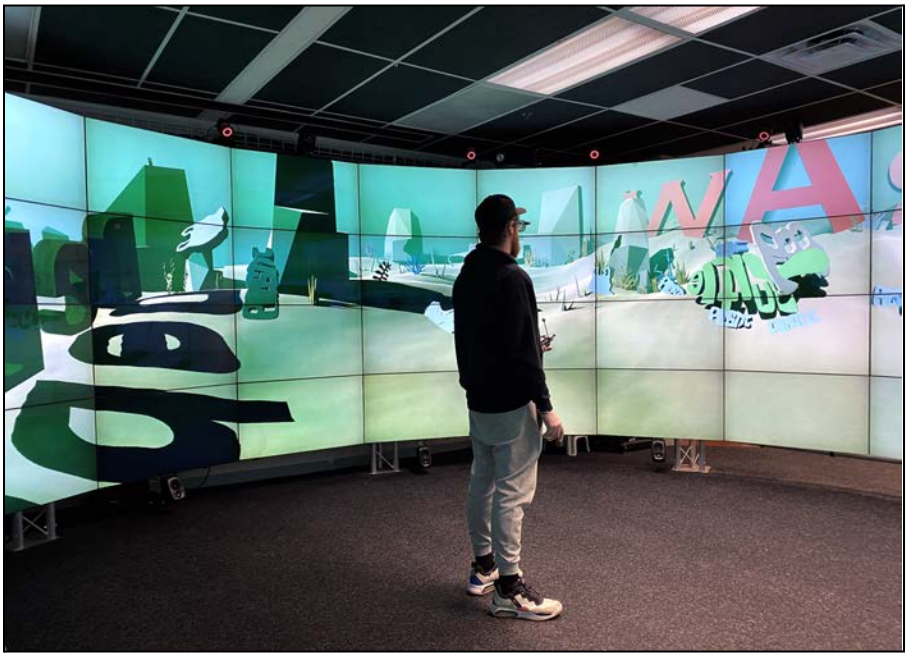

Figure 2.2 shows a student interaction with a marine animal in distress

Figure 2.3 shows a group of students witnessing a cleaner and healthier environment

CONCLUSION:

In conclusion, our Virtual Reality (VR) simulation addresses the critical issue of plastic pollution. By immersing users in an engaging narrative that seamlessly integrates environmental challenges and solutions, we aimed to cultivate a heightened awareness of the profound impact of plastic and trash waste on marine ecosystems. Through the dynamic experience of navigating and cleaning a simulated underwater environment, users not only gained insights into the urgency of responsible waste management but also actively participated in the preservation of marine life. As we embrace the immersive potential of technology, let this simulation serve as a catalyst for informed action, inspiring a generation of environmentally conscious global citizens.

CITED SOURCES:

Plastic pollution. Education. (n.d.). https://education.nationalgeographic.org/resource/resource-library-plastic-pollution/

Plastic waste inputs from land into the ocean | science. (n.d.). https://www.science.org/doi/10.1126/science.1260352

The Pew Charitable Trusts. (n.d.). *Preventing ocean plastics*. The Pew Charitable Trusts. https://www.pewtrusts.org/en/projects/preventing-ocean-plastics

Lead in plastics – recycling of legacy material and appropriateness of current regulations. Plastic Pollution Coalition. (2023, November 21).

United Nations. (n.d.). *Goal 14* | *Department of Economic and Social Affairs*. United Nations. https://sdgs.un.org/goals/goal14

Parker, L. (2021, May 3). *Plastic pollution facts and information*. Environment. https://www.nationalgeographic.com/environment/article/plastic-pollution