

Life Underwater

A Virtual Reality Experience Below The Sea

Plastic Pollution on Marine Life, Human Responsibilities and Design Approach

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Life Underwater is a virtual reality (VR) project that aims to recreate the effects of plastic pollution on life underwater, based on data collected by studies that give us a better understanding of the impact plastic has on marine life. We based our VR on the UN Concept of Underwater to tackle the problem with plastic pollution. The concept of this project is to encourage people to take drastic measures in their lifestyle to prevent as much plastic waste as possible, but also create a solution to be used to reduce such effects. It can help to advance this research because it emotionally connects the viewer to a tragic reality. Life Underwater will portray how million metric tons of plastic that end up in the ocean each year affect marine life. By using VR as a medium to help users experience unpredictability and difficulty of marine life using first-person narration, Life Underwater helps to see, feel, and interact with things within a multi-dimensional "illustration" of underwater life.

CCS CONCEPTS • Human-centered computing → Interaction Design → Interaction design process and methods → Activity centered design • General and reference → Cross-computing tools and techniques → Design • Applied computing → Arts and humanities → Media arts

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1 Introduction

Scientists predict that by the year 2050, 99 percent of all seabird species would have consumed at least one piece of plastic, and they estimate that 60 percent of all seabird species have already consumed plastic fragments [6]. When taking this in account it brings up a true perspective of the problem with plastic pollution. This type of

pollution is only going to add up and continue to poison our environment. Our VR project is created in order to possibly create a new solution moving forward to reduce such pollution. In this project we use size and abundance to emphasize the effect pollution truly has on the sealife. Many of the objects you see are quite large in comparison to regular trash. How does one clean up all this pollution? By using a handheld UV light ray that is proven to break down the particles in plastic pollution. As the user continues to use the UV light ray the environment starts to clear up. Eventually one will end with a beautiful sea life environment which we strive to come true.

1.1 Life Below Water and tragic reality

Pollution has always been a major problem ,but in the more recent years many of us have finally started to see the effects pollution has done to the world we live in. This project specifically is targeted at certain pollutants in something that covers the majority of the earth and that is water. Plastic pollution is not only depressing to look at ,but it seriously impacts the environment and the animals negatively. Plastic waste can suffocate and starve fish, turtles, and other marine animals [2]. Many sea creatures have mistaken trash for food. This means these animals are not getting the nutrients that they need to survive and will starve to death. Not only the animals are affected but the plant life is also impacted. For example, Ocean viruses can thrive from plastic garbage. According to a study, corals that come in contact with plastic have an 89% probability of developing disease, compared to 4% for those that don't [7, 8]. These diseased plants/animals die or affect the sealife around them causing other plants and animals to get sick too. With this project our team has created a solution to reduce the amount and the effects of plastic pollution.

2 SOLUTION - VIRTUAL REALITY "LIFE UNDERWATER"

According to the UN, 800 species are harmed by marine waste, and 80% of it is plastic [1]. Our solution was to use a UV light in order to break down the plastic pollution. UV energy absorbed by plastics can excite photons, which then create free radicals. The presence of catalyst residues and other impurities will often act as receptors and cause degradation of plastic. (4). With that being said in the VR the user has a handheld UV light ray that is used in order to clean the sea floor till there is no more plastic pollution. Some plastics disintegrate considerably faster than others into microscopic particles that wind up in seafood we consume [3, 4, 5]. Now moving forward with the UV ray the microscopic pollution will be found less in the food we eat.

2.1 Ideation and Storyboard

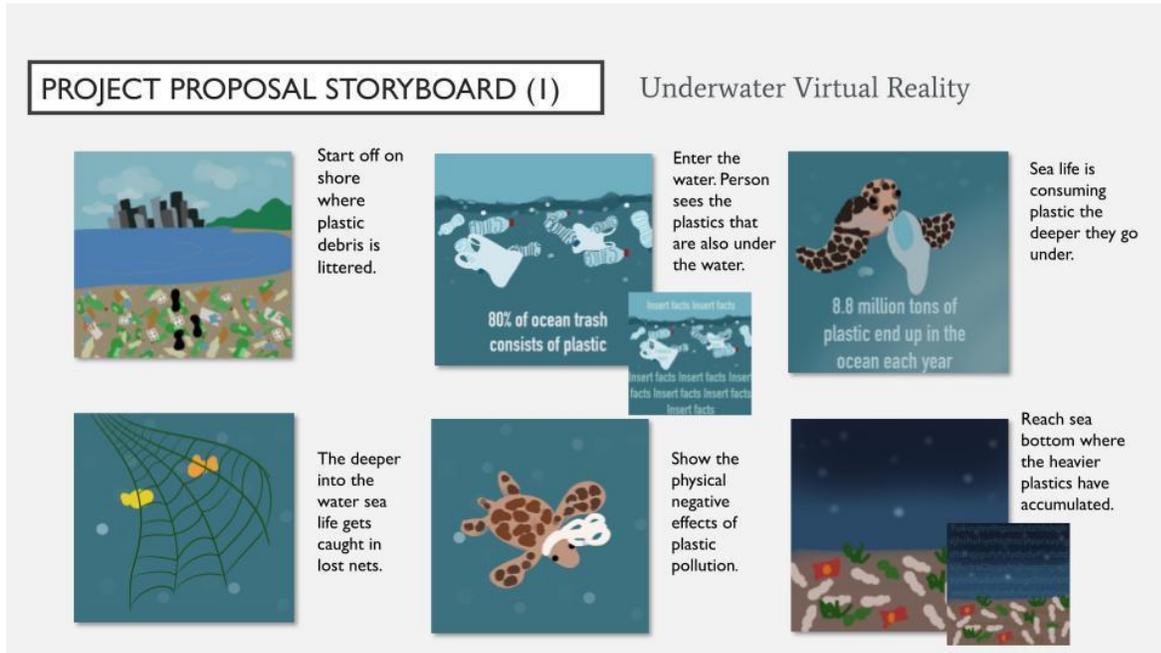


Figure 2: Storyboard of early idea.

We choose to move on with a different path from our original storyboard in order to include more typography and make it more clear for the virtual aspect.

PROJECT PROPOSAL STORYBOARD (2)

Underwater Virtual Reality



Start off underwater, see polluted water with floating trash right away.



As moving forward, more more unlively/dying creatures appear along with facts (w/ or w/o audio when touched). Materials rendered.



A cleaning device will appear during moving forward. Pick it up and start cleaning process.



Hit button to illuminate the cleaning/ purifying light. Color starts changing.



As the process goes on, the polluting materials disappear/ transform back to creatures. Bad facts change into good facts when the light touches.



As having a cleaner water, we have a better view of the beautiful and colorful underwater life.

Figure 2: Storyboard of final idea.

2.2 Virtual Environment

Our environment is set at the bottom of the ocean where plastic debris has started to accumulate. At first the environment starts with decaying plant life and trash all around. The trash is abundant and has taken over the entire ocean floor. The setting is large with uneven rock structures all around to roughen the stage. Within the surrounding area we include fish, sharks, and whales. There is still sea life, but they are slow and dark. The original environment starts off dark and mucky, but once the environment is cleaned using the UV light the setting changes. The environment becomes brighter, the pollution is gone. The sea life starts thriving with colorful plantlife and an abundance of fish. Now with the brighter environment the user may walk around and notice all the colors that have come back and new structures that have arisen.

2.3 Interaction

When the user first starts in Life Underwater they will hear the sound of being underwater. The user will be surrounded by trash and bad facts. They are able to use UV light to be able to destroy the plastic trash and are able to change the bad fact about pollution to a good fact about pollution. While using this function one is to hear a muffled sound of the UV ray. They will know it changes when the type color changes from red to green. Continue on with cleaning till the majority of the trash is cleared and eventually the environment will change with a pleasant ringing chime to show a beautiful clean sea environment.

2.4 Challenges

Some challenges we came across was deciding how to emulate the blue light to show the breakdown of cells. We wanted to relay the impact of the pollution and our solution in the best possible way. In order to do that we added the green overlay around the trash to emulate a negative inclination and used the destroy command to completely break down the cells.

3 Conclusion

In the end we hope to have brought a sustainable solution to the problem of plastic solution. Our goal was to not only bring awareness, but find a feasible way of lessening pollution in the future. While creating this project we the creators of Life Underwater have had an awakening about the topic of pollution and hope others will have the same awakening. To create solutions to clean debris for the sealife and for our own. In the future we hope our VR is able to inform others of new solutions to plastic pollution and encourage others to find their own solution to this problem.

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REFERENCES

- [1] United Nations. December 5, 2016. UN report finds marine debris is harming more than 800 species, costing countries millions. Retrieved September 6, 2022, from <https://www.un.org/sustainabledevelopment/blog/2016/12/marinedebris/>
- [2] Reddy, S. September 24, 2018. Plastic pollution affects sea life throughout the Ocean. The Pew Charitable Trusts. Retrieved September 6, 2022, from <https://www.pewtrusts.org/en/research-and-analysis/articles/2018/09/24/plastic-pollution-affects-sea-life-throughout-the-ocean#:~:text=It%20is%20estimated%20that%20up,suffocation%2C%20starvation%2C%20and%20drowning>
- [3] Alliance for the Great Lakes. August 1, 2022. Great Lakes Plastic Pollution. Retrieved September 6, 2022, from https://greatlakes.org/great-lakes-plastic-pollution-fighting-for-plastic-free-water/?gclid=Cj0KCQjw39uYBhCLARIsAD_SzMS8ShlsbpDE80VUh3QODayPeMxlhOkUEWlg_ZIkGnW4gYrIHIFiPEaAsGjEALw_wcB
- [4] Susan Gawlowicz. December 19, 2016. Researchers study plastic pollution in Great Lakes. Retrieved September 7, 2022, from <https://www.rit.edu/news/researchers-study-plastic-pollution-great-lakes>
- [5] National Oceanic and Atmospheric Administration. February 26, 2021. What are microplastics? Retrieved September 10, 2022, from <https://oceanservice.noaa.gov/facts/microplastics.html>
- [6] Chris Wilcox, Erik Van Sebille, and Britta Denise Hardesty. Received January 2015. Proc Natl Acad Sci USA, Issue 38 (September 22, 2015). <https://www.pnas.org/doi/10.1073/pnas.1502108112>
- [7] Coral Reef Alliance. March 17, 2021. This Global Recycling Day, consider the coral reefs. Retrieved September 6, 2022, from <https://coral.org/en/blog/this-global-recycling-day-consider-the-coral-reefs/>

- [8] Joleah B. Lamb, Bette L. Willis, Evan A. Fiorenza, Courtney S. Couch, Robert Howard, Douglas N. Rader, James D. True, Lisa A. Kelly, Awaludinhoer Ahmad, Jamauddin Jompa, and C. Drew Harvell. Received October 2017. *Science*, Vol. 359, Issue 6374 (January 26, 2018). <https://www.science.org/doi/10.1126/science.aar3320>