WaterCAVE

Virtual Reality for Engaging the Next Generation in Wastewater Management

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ABSTRACT

WaterCAVE is a pioneering virtual reality (VR) simulation designed to tackle the impending retirement challenge within the water and wastewater sector. Utilizing Unity's 3D real-time development platform, it offers students from Pre-K to 12 a unique opportunity to explore a virtual wastewater treatment plant. Using an immersive ten-sided display, WaterCAVE guides students through the intricacies of wastewater treatment, introducing them to various personnel roles within the industry. By providing an engaging and interactive experience, WaterCAVE aims to inspire the next generation to consider careers in wastewater management, potentially alleviating future workforce shortages. This innovative tool holds promise in fostering a renewed interest in the industry and facilitating a steady influx of new professionals.

INTRODUCTION

The aging workforce, recognized as a pressing concern by the American Water Works Association since 2019, presents a significant challenge in the water industry. With over two-thirds of its workforce aged 45 and above, and nearly half eligible for retirement within the next decade, this demographic shift threatens the vital skills and knowledge essential for maintaining water quality and infrastructure. Despite the sector's promising opportunities, there exists a shortage of skilled personnel, further compounded by a lack of diversity, notably among women.

To confront these obstacles, we propose harnessing virtual reality (VR) technology to introduce wastewater facilities to the upcoming generation of workers. This initiative entails an immersive virtual tour of a wastewater treatment facility, leveraging VR as an educational tool to foster the development of a proficient workforce while underscoring its significance in research.

This research delves into the potential of VR technology to revolutionize public engagement and instigate a cultural transformation towards enhanced diversity within the wastewater industry. Through immersive learning experiences, students gain valuable insights into the intricacies of wastewater treatment and engage with a diverse array of personnel, potentially cultivating a more inclusive and varied industry landscape.

TECHNOLOGY & SOFTWARE

Unity® AUTODESK

METHODS & APPROACH

In developing WaterCAVE, programs like Autodesk's Maya and Adobe's Illustrator, Photoshop, Substance Painter, After Effects, and Premier Pro were utilized. These tools were crucial in creating 3D assets, GUI elements, and animations. Post-tour, a brief questionnaire will assess students' perceptions and knowledge of the wastewater industry, aiming to measure any changes influenced by the WaterCAVE experience.

WaterCave: Interactivity Workflow

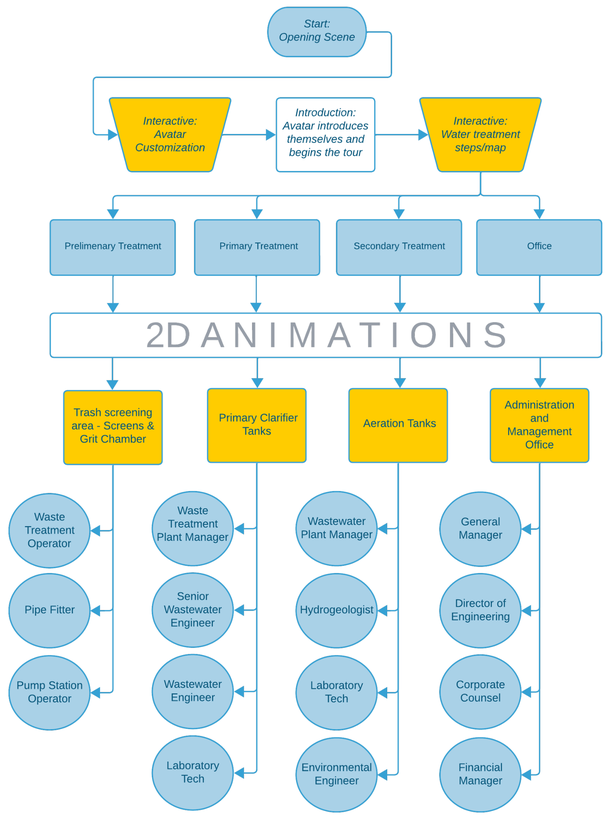

Fig. 1 The interactivity workflow showcasing the different steps of the wastewater treatment process and their interactible sections.

Fig. 2 Development of the customizable avatars that shows a few options for character customization and the range of variety available.

Fig. 3 The tour guide customization scene. Students are able to choose how their avatar will look.

MAVRC
MACHINE & ARTIFICIAL INTELLIGENCE VIRTUAL REALITY CENTER

EPA United States Environmental Protection Agency

RESULTS

Throughout the development phase, WaterCAVE has successfully incorporated several key features:

- A customizable virtual tour guide allows students to visualize themselves within the simulation or utilize a personalized representation.
- An interactive map grants students the freedom to explore different aspects of the wastewater treatment process according to their interests.
- Engaging non-player characters (NPCs) interact with students, providing insights into their respective roles and responsibilities within the treatment facility.

Looking ahead, potential enhancements could include:

- Integrating educational games at each stage of the treatment process to further enrich students' understanding of wastewater treatment methodologies.

Fig. 4 A view of the Preliminary Treatment building. The first step in the wastewater treatment process.

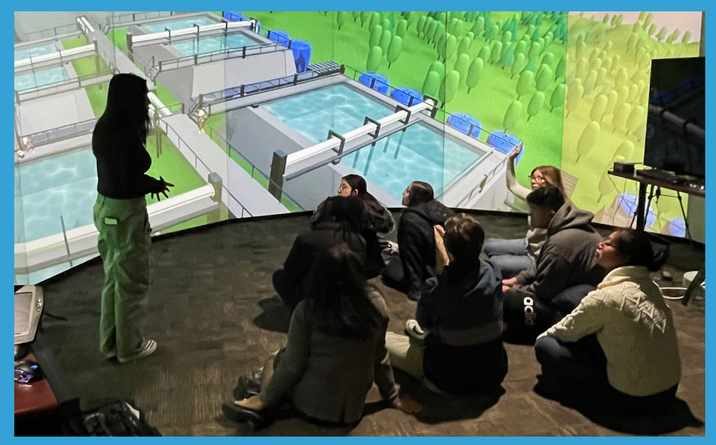

Fig. 5 students within the projected system viewing the WaterCAVE facility tour.

CONCLUSION

WaterCAVE is presently undergoing field testing with students in the South Jersey region as part of a broader initiative led by Rowan University called Waterworks. This initiative seeks to deploy interactive media tools aimed at engaging and inspiring the future generation of wastewater treatment personnel. WaterCAVE leverages VR technology to cultivate active participation and stimulate interest among students, encouraging them to explore and consider careers in wastewater treatment.

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