



Truth with Hope: Teaching the SDGs through Immersive Learning

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Abstract. Earth and its inhabitants are on a crash course to destruction. To remedy this trajectory, the United Nations created 17 Sustainable Development Goals (SDGs), which implore both developed and developing countries to join together and tackle climate change, preserve our oceans and forests, end poverty, and improve health, education, and inequality [1]. Teaching these complex issues to students can be a daunting task. This session will present two case studies to explore how immersive learning environments can help students develop critical thinking skills, empathy, and a sense of agency concerning the SDGs. We will cover best practices for designing and integrating immersive learning environments into existing curriculum and strategies for assessing student learning. The social, pedagogical, and ethical challenges will be discussed. Our goal is to ignite thought on how immersive learning can accelerate progress toward the SDGs and inspire students to take action to create a more sustainable world.

Keywords: Immersive Learning, Sustainable Development Goals, Virtual Reality, Pedagogy, Story.

1 Immersive Learning Case Study: SDG 14, Life Below Water

SDG 14: Life Below Water seeks to: “conserve and sustainably use the oceans, seas and marine resources for sustainable development” [1]. In response to the need for SDG education that engages children and youth [2], two educators designed a FrameVR environment that focuses explicitly on the learning targets for SDG 14. The FrameVR builds on research that evidences the impact of virtual reality on teaching ocean acidification [3] and learning ocean conservation and environmental sustainability [4]. Design principles and pedagogical strategies recommended by [5] and [6] were utilized to develop an intentional and meaningful immersive learning experience with cross-curricular connections to the SDG targets.

The FrameVR environment is designed for high school teachers looking for a novel and influential way to incorporate the SDGs into their curriculum: <https://framevr.io/sdg-14> (See Fig. 1). The virtual location is an island surrounded by ocean to give students a better feel for SDG 14. The calming colour scheme was selected to help balance out the harsh reality within the content on the island. To avoid student distraction with the platform and reduce cognitive load, the colour palette is coherent throughout all content. Educational resources within the FrameVR environment include carefully curated videos, slideshows, simple infographics, images, articles, and micro-learning content. The resources follow copyright guidelines, and all sources are cited.



Fig. 1. Screenshots from the SDG 14 immersive learning environment.

1.1 Guided Learning Adventure

Three interconnected sections offer a self-paced immersive learning adventure: Overview, Prevention/Protection and Current Events/Efforts. Each section has a gathering space for students to discuss questions, concerns, and feelings about SDG 14 (communication is through video, voice, and chat). The purpose is to ignite student collaboration and receive feedback from peers and teachers to enhance understanding of SDG 14. The Overview section introduces students to the relevant terms and information. Next, students are challenged to put their critical thinking and learning into action in the Prevention/Protection section as they contribute ideas and efforts for bettering our world with healthy oceans. Students learn about current issues in the Current Events/Efforts section; the goal is to take inspiration from the innovative efforts happening locally and globally in support of SDG 14.

Teachers need to set norms for students to behave appropriately within the FrameVR. Expectations to act kindly and responsibly are necessary to ensure a safe learning experience for everyone. Formative and summative assessment strategies integrated with the FrameVR environment include a learning journal, quizzes, checklists, and Padlet brainstorming. Students have various ways to demonstrate mastery of the learning objectives.

2 Immersive Learning Case Study: SDG 15, Life on Land

In a grade 8 class (n=28), students were invited to be co-researchers in a study: Youth Mobilizing Action on Sustainability Using Digital Tools and Storytelling. The research explored how youth can build relationships with the environment and mobilize action on the SDGs by learning and creating in virtual reality. The methods for data collection included artifact analysis, observations, surveys, and semi-structured interviews. The study builds on research that examines how immersive learning experiences can be a meaningful and affordable solution for visualizing issues like climate breakdown and increasing empathy for conservation efforts [7], [8], [9], [10].

The co-researchers visited the University of Saskatchewan to participate in a two-day workshop on designing in virtual reality. Using the Meta Quest head-mounted displays, the co-researchers collaborated to co-create art with their peers in MultibrushVR; design challenges focused on SDG 15, Life on Land [1]. Research activities involved guided exploration of environmental and sustainability issues in AltspaceVR worlds. The class worked together to co-create an educational and interactive gallery in FrameVR to teach their friends and family about deforestation: <https://framevr.io/ecojustice> (see Fig 2).

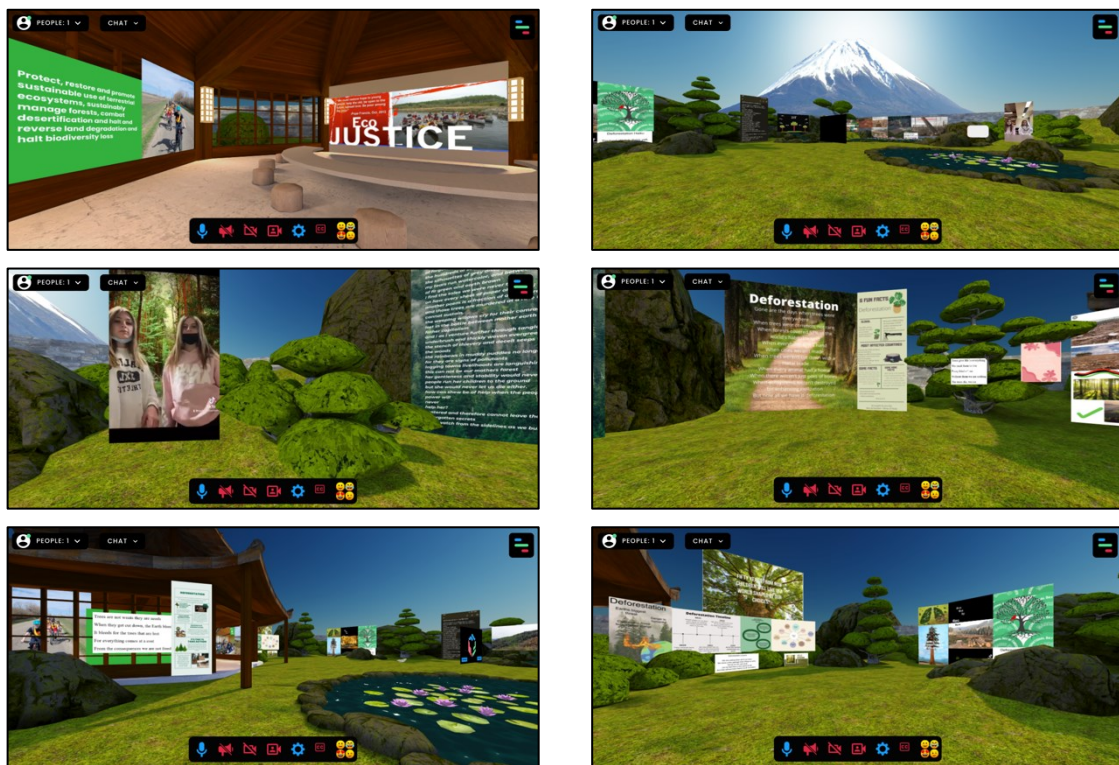


Fig. 2. Screenshots from the SDG 15 immersive learning environment.

2.1 Empowering Students as Creative Designers

The FrameVR gallery is an example of personalizing learning on issues related to SDG 15; the co-researchers contributed artifacts representing their concerns and points of view. Today's youth are concerned about whether there is enough action on the SDGs by the government and political movements. One way to counter this problem is to make progress one student at a time, one class at a time, valuing what we can do as citizens, and creating positive ripple effects in our lives, homes, schools, communities, and beyond [7], [11].

Although the SDGs are global priorities, they are challenging to teach in traditional classrooms, such that students understand the connections between their actions and the consequences on our people and planet [7], [11]. The exploratory case study contributed novel pedagogical approaches for SDG education, integrating immersive storytelling and authentic learning experiences co-created by youth. The co-researchers gained a deeper understanding of themselves as designers, world builders, and responsible citizens.

3 Design Principles

Six design principles to guide educators and designers in creating immersive learning environments for SDG education in the everyday classroom:

- **Integrate micro-learning:** Ensure there are various ways for students to master the learning objectives by including micro-learning content. For example, students can construct knowledge around the SDGs through interactive polls, Padlet brainstorming, Tik Tok and YouTube videos, images, infographics, audio lessons, pdf documents, personal stories, and learning games [5].
- **Value collaboration and social learning:** By leveraging the spatial design benefits, immersive learning environments have the potential to increase co-presence and foster personal connections among students. This can be used to cultivate a sense of community where students can develop trusting relationships and build the creative confidence necessary to pursue new learning goals [3].

- **Take advantage of gamification for increasing motivation:** Motivation through gamification and checkpoints will help to keep students engaged, focused, and curious to keep moving through the content and required tasks. Gamification can help prepare students to respond quickly to challenges and think creatively and optimistically about how we can achieve the SDGs [5].
- **Empower students as creators and innovators:** Encourage students to showcase their abilities and skills in fresh and innovative ways, for instance, through immersive storytelling or world-building assignments. Assign design challenges that are feasible and have clearly defined criteria. Refrain from giving any hints regarding a particular solution, as the objective is to encourage students to generate innovative and unforeseen ideas [3].
- **Pair the immersive activities with a learning journal:** Students can document their knowledge and growth in a companion learning journal connected to the immersive environment, including formative and summative assessment activities. Teachers can use the learning journals to assess mastery of the learning objectives based on each student's knowledge, skills, and attitudes surrounding the SDGs [6].
- **Challenge students to be sustainability problem finders and problem solvers:** Teaching the SDGs within immersive environments involves learning about and solving real-world problems. Students need an opportunity to investigate complex sustainability issues, ask critical questions, and put forward solutions from their imaginations and optimistic spirits [11].

4 Conclusion

The SDGs provide a roadmap for a liveable future, addressing the health of the planet and human well-being with an emphasis that no one should be left behind. It can be complex and daunting for educators to teach about the global goals and the specific targets for climate action, poverty, health, education, and equality. Some of the challenges are limited resources and capacity of education systems, lack of professional development for teachers, uncertainty about which subjects are the best fit for SDG education in an over-prescribed school curriculum, political interference from local government or community stakeholders, and a need for assessment tools that measure the learning outcomes effectively.

To address some of the challenges of teaching the SDGs, we presented two case studies that examine the affordances and constraints of immersive learning environments designed by teachers and students, focusing on SDG 14 (life below water) and SDG 15 (life on land). By discussing best practices for designing and integrating immersive learning into existing curricula and strategies for assessing student learning, we hope to inspire educators to consider creating immersive learning experiences with and for their students. The goal is to use technology in meaningful ways to empower and motivate students to get involved with local efforts for achieving a more equitable and sustainable world, thereby accelerating progress toward the SDGs and mobilizing youth voices on issues concerning their lives and future.

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