iSea

Immersive virtual reality environments to evaluate audience attitudes about science communication projects: a pilot study of deep-sea ecosystems

iSea
A Science Communication R&D Project

Start Date: 01-NOV-2018
Revised End Date: 31-OCT-2020

Total Approved Funding (PT): €99 860
Total approved Funding (UT Austin): $79 000

TEAM

PI in Portugal:
Carla Morais, Faculty of Sciences of the University of Porto (FCUP, U.Porto)

PI at UT Austin:
Lucy Atkinson, Stan Richards School of Advertising & Public Relations, Moody College of Communication

Other partnering organizations:
Faculty of Engineering of the University of Porto (FEUP, U.Porto)
Research Center of ESAD, College of Arts and Design (esad-idea)
Centre for Astrophysics of the University ofPorto (CAUP, U.Porto)
Sociedade Afonso Chaves (SAC)
Enigma Virtual, Lda.

Background

Evaluation has moved up the agenda in science communication. However, some procedures, while available, may be too obtrusive to use recursively in science centers and/or conflict with science center visitors' agendas. Our idea was to develop a non-obtrusive, valid and replicable method to evaluate audience attitudes about science communication projects through an immersive virtual reality environment (VRE) on deep sea that can improve exhibitions while educating and empowering citizens. We have embraced the Atlantic International Research Center agenda, specifically, deep-sea ecosystems sus-tainability, by producing new digital content and carrying out pilot studies in local and national science centers.
This approach will fill a gap in existing models that 1) fail to account for self-generated visitor narratives about their science center experiences; 2) ignore the role of the visitor in the evaluation process itself; and 3) disregard the effects of test-enhanced learning in the transferability of knowledge to other contexts.
The project consists of a pilot study on deep-sea ecosystems, using immersive virtual reality environments to understand and evaluate the audience's attitude towards Science Communication projects.

Approach/Methodology

In order to develop the immersive virtual reality environment, we extended the transformational play framework into the field of science communication. The immersive virtual reality environment has two modalities: for one person (individual condition) and for a group of individuals (collective condition), supported by a game-based approach and multilinear storytelling. The journey takes visitors into extreme deep-sea conditions, scaffolded according to three levels - a) awareness, b) understanding and c) engagement - regarding science/technology processes and contents. In the individual condition, the environment consists of a capsule with head-mounted displays and headphones to provide an immersive experience. In the collective condition, the digital environment is projected fulldome in a hemisphere room.
In both cases, visitors apply for a passport, choose a character, a mission, and face a dilemma - either for or against mining active/inactive hydrothermal vent fields in Azores. The difference is that in the individual condition the environment responds directly to the visitor's actions while in the collective condition it mirrors the consequences of the majority of choices. In the end, visitors receive a personalized "deep-sea-gram", which is a short summary of their path through the game. More than delivering stories, the "deep-sea-gram" is expected to push visitors to create and share their own stories about their experience and to signify their relationship with the scientific endeavor. To develop a comparative framework, we ran several experiments to validate the method via within- and between-subjects plans.

Implementation Challenges

In addition to the foreseeable temporal issue being a challenge in achieving the objectives of this highly complex, highly interdisciplinary and innovative project, there is a need for the permanent articulation of the scientific approach with the technical and design development, also if we consider the construction of the non-invasive evaluation method. Because it is an intricate project, it requires constant iterations and interactions among the team members. In addition, being a science communication project about a novel theme as the deep-sea ecosystems, interactions with deep-sea specialists were key in content validation. So, we've learned somehow to consider limitations as engines for developing the project, instead of seeing them as obstacles.

UTAustin Portugal

FCT Fundação para a Ciência e a Tecnologia

TEXAS The University of Texas at Austin

SPACE-EARTH INTERACTIONS

Main Findings

Before developing and testing the non-obtrusive method, we carried out pilot research in Portugal and the USA aiming at strengthening the reflection about "how to communicate and to evaluate cutting-edge knowledge in non-formal contexts."
Results suggest a poorly structured social representation of science communication, anchored to dissemination and mass media.
In its turn, deep sea's representational field is organized in four dimensions: the surface of the sea, leisure, fear (of the unknown) and science and technology, which seem associated with different individual attributes, such as education level or sex. For instance, respondents associating the deep sea with surface terms have an educational level up to secondary and moderately agree with scientific exploration of the deep sea; participants associating the deep sea with science and technology are mostly men, with 18 to 29 years of age, undervaluing deep sea's importance to leisure and tourism.
Results obtained seem to support our main goal, that is, to validate a non-invasive replicable method of evaluating science communication, as the majority of participants responded to an automatic interview embedded in the VRE, making sense of the experience. In addition, information collected through the I SEA's Analysis System (AS) correlate with information from in-person interviews and questionnaires. For example, participants' choice of character (i.e. environmental activist, economist or scientist) in the VRE partially mirrors their attitudinal position towards the deep sea's preservation, and its economic or scientific exploration. On the other hand, results also ask for the development of new, VRE integrated measures of science communication evaluation.

Expected Impact

The results of the previously mentioned research suggest that virtual reality (as an emerging technology) is objectified in specific equipment like headsets and anchored to computers and games, associated with immersion and interactivity. Virtual reality appears to be a promising symbol for the technology of the future. However, the risk mentioned by the participants and the disadvantages presented in the form of illusion, alienation, falsity and addiction, to underline the tension between potentialities and threats. The triangulation between these preliminary results and the set of interviews highlighted the potential for acceptance of the project's major technological and communication outcomes.
The commercialization also needs to be considered since we are talking about the following outputs: a collection of digital content and messaging about ecosystems for science communication; immersive VRE– I SEA as prototypes for other complex science phenomena; and new, methods for the evaluation of science communication implemented in real world scenarios like science centers and museums. VR storytelling is being successfully adopted by various newspaper outlets and TV stations as a novel way of engaging audiences in journalism storytelling. We expect similar trends in communicating complex scientific information.

Project Highlights

1. Development of the narrative aimed at enriching the virtual reality immersive experience.
2. Delimitation and development of a whole set of data collection instruments that allow us, in a non-obstructive way, to obtain indicators about participant awareness, understanding, and involvement with deep sea ecosystems.
3. Perception of directors, monitors, and visitors of the Planetário and Expolab Centers, on how the non-obtrusive digital evaluation method, directly integrated into an exhibition, would work in a real context.
4. Usability studies focused on technological development and capsule design options that would be used in the virtual reality experience, taking into account necessary adjustments.
5. Conclusion of the first digital prototype in virtual reality environments. It was demonstrated at the Summer School ISEA (which took place in July 2019 at the Astrophysics Center of the University of Porto), with participation of UT Austin partners. Production of the physical prototype. The two physical prototypes are installed as planned at Expolab, and Planetário do Porto, and the data collection phase for the individual condition was finished. The collective modality, which consists of the full-dome projection of the narrative at the Planetário do Porto, is currently being tested, with data collection expected to begin shortly.

UTAP-EXPL/CD/0106/2017