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WebVR for Science Communication: A Framework-Based Approach for Citizen Science in the Aguieira Reservoir for the 2Qua project

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Bridging Science and Society

Inland water ecosystems are vital, yet complex hydrological data rarely reaches non-specialist audiences (Martins et al., 2019).

This disconnect between science and society limits community engagement in reservoir conservation, the exact challenge addressed at the Aguieira Reservoir.



Img.1 - Aguieira Reservoir – Catarina Guimarães



Img. 2- Aguieira Reservoir – Catarina Guimarães

Introduction and Environmental Challenges

Scientific Disconnect: Protecting the aquatic ecosystems of reservoirs is often hindered by a communication gap between researchers and local communities (Jefferson et al., 2015).

Deficit Model: Linear and one-way methods of information dissemination are proven ineffective for triggering real behavioral changes (Simis et al., 2016).

Citizen Science: Promotes the democratization of science by empowering local communities in participatory monitoring and ecological literacy (Vohland et al., 2021).

Interactive Narratives: Using virtual environments and context-specific storytelling reduces psychological distance toward complex environmental problems (Fauville et al., 2024).

The 2Qua* Project

Context

- Assesses water quality and quantity in the Aguieira and Alto Rabadão reservoirs
- Combines ecological monitoring, remote sensing, and a citizen science strategy
- Identified the need for an accessible, interactive science communication resource



Img.3 – 2Qua reunion at Faculty of Science of University of Porto – Catarina Guimarães

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Research Question & Objectives

Aim of the Study

- How can an interactive resource, built on an immersive narrative, promote science communication about the Aguieira Reservoir?
- Develop a *framework* for effective science communication resources
- Co-create the resource with researchers from the 2Qua project
- Evaluate its usability and communicational effectiveness



Img.4 - Aguieira Reservoir– Tiago Paralta



Img.5 – Aguieira Reservoir – Tiago Paralta

Methodology: Design-Based Research (DBR)

1

Theoretical & Benchmarking

Analysis of multimedia resources. Elaborating the conceptual Framework Version 1.

Participants: researcher (individual analysis)
Instruments: literature review & multimedia benchmarking matrix

2

Script Co-creation

Structuring narrative with 2Qua researchers (field & lab protocols).

Participants: 2Qua researcher (5 co-creation sessions)
Instruments: field/lab immersion notes & narrative script

3

Figma Prototyping & AI

Low-Fi (structural) and Mid-Fi (navigable with real field/lab multimedia data) phases.

Participants: researcher + AI tools (ChatGPT, Canva AI)
Instruments: Figma (Low-Fi & Mid-Fi prototypes)

4

Evaluation & Iteration

Analytical usability walkthrough with experts. Finalizing refined Framework V2.

Participants: panel of 5 experts (2Qua + Multimedia + Sci-Comm)
Instruments: Cognitive Walkthrough & Participant Observation

Methodology: Usability Evaluation

Collection & Analysis Instruments

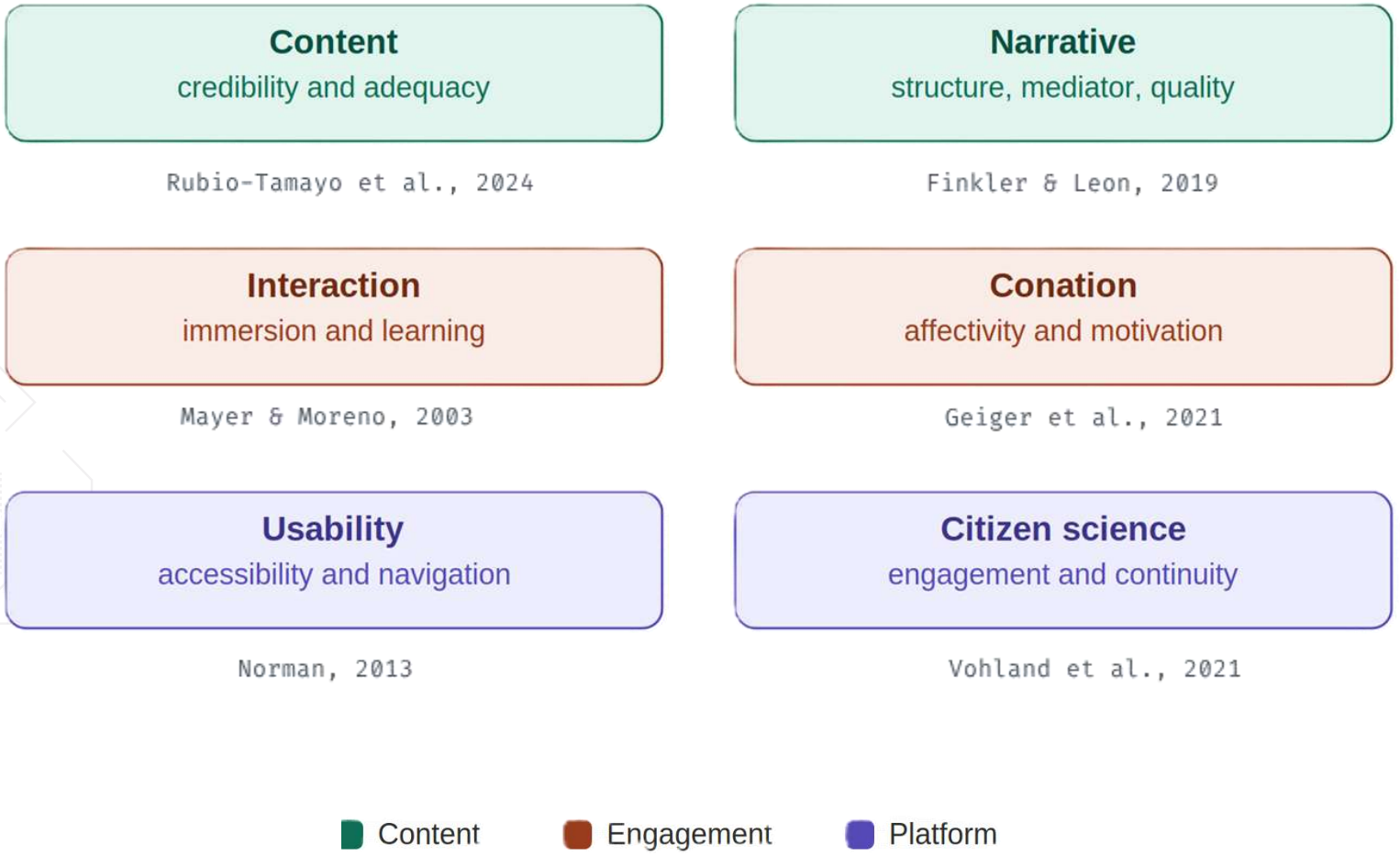
Cognitive Walkthrough (CW): Usability inspection method focused on the analytical exploration of critical tasks by experts . Rieman et al., 1995

Participant Observation: Qualitative field notes captured during the active testing and exploration phases.

Qualitative Panel of Experts (N=5)

P1 (Scientific Expert): Researcher of the 2Qua project.
P2 & P3 (UX/UI Experts): Students of Multimedia.
P4 & P5 (Science Communicators): Students of Science Communication.

Framework — *grounded in the literature reviewed in the Theoretical Background*



Building the Prototype

1. Narrative script co-created with a 2Qua researcher, structured in four guided tasks and prototyped in Figma
2. Real photos and footage from the Aguieira fieldwork and the 2Qua laboratory
3. An AI-generated scientist avatar guides the user throughout the experience (Chat GPT and Canva AI)
4. 360° videos add an immersive layer - observing plankton underwater and microplastics under a virtual microscope



Software used
Figma – Low-Fi & Mid-Fi prototyping
ChatGPT – avatar artwork (AI-generated)
Canva AI – avatar animation (AI-generated)
All other photos/footage are real, not AI-generated.
Screen recording: Mid-Fi prototype — Tiago Paralta, 2026

Key Outcomes

Task Evaluated	CW Step Most Affected	Identified Usability Bottleneck	Iterative UI Correction (v3)
T1: General Navigation	**Feedback &** visibility of controls	On-screen text did not match the narrated audio; no return path to the welcome screen (P1–P5).	Synced on-screen text with narration; added a consistent button back to the welcome screen.
T2: Field Sampling	**Sequence &** pedagogical scaffolding	Tool order felt unintuitive; no objectives shown before starting the task (P3, P4, P5).	Reordered tools to match the real sampling sequence (bottle, probe, Secchi disk, net).
T3: Lab Filtration	**Credibility of** visual content	Plastic filtration tools shown instead of glass; no information on the FTIR equipment (P1).	Replaced images with glass apparatus; added a new page explaining the FTIR equipment.
T4: Nitrate Analysis	**System feedback** & ecological meaning	Protocol felt complex; no link shown between the result and its ecological meaning (P1).	Simplified the protocol (micropipette only); linked the result to the ecological status.

Key Outcomes: Usability Synthesis

Highest Consensus
Usability + Content
Priority areas for intervention: Accessibility, Navigation, Credibility, Adequacy

Deeper Conceptual Feedback
Narrative + Interaction
Suggestions on Narrative Structure, the Mediator, and Immersion

Innovation Pathways
Conation + Citizen Science
Opportunities in Affectivity and Engagement to differentiate the resource

Results

Prototype v3: synced audio and text, consistent navigation, corrected scientific imagery
Framework v2: streamlined from 21 to 13 subdimensions, same six core dimensions
Usability and credibility confirmed as prerequisites for narrative, interaction, and conation to take effect

Conclusions & Future Work

Key Conclusions

The interactive simulation resource proved highly viable and effective for contextualizing water quality monitoring protocols.

Framework V2 conceptual refinement successfully consolidated user-centered design and scientific accuracy requirements.

Identified Limitations

Missing tests with common local citizens living around the Aguieira Reservoir

Small qualitative panel (N=5); no quantitative literacy/attitude measures

Future Directives

Field deployments and empirical evaluation in local schools and communities near the Aguieira Reservoir within 2Qua project scope.

Developing and polishing the interactive algorithms into a native, open-source 3D WebVR environment (WebXR/A-Frame).

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Thank you all for your attention

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Thank you! Questions & Discussion



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