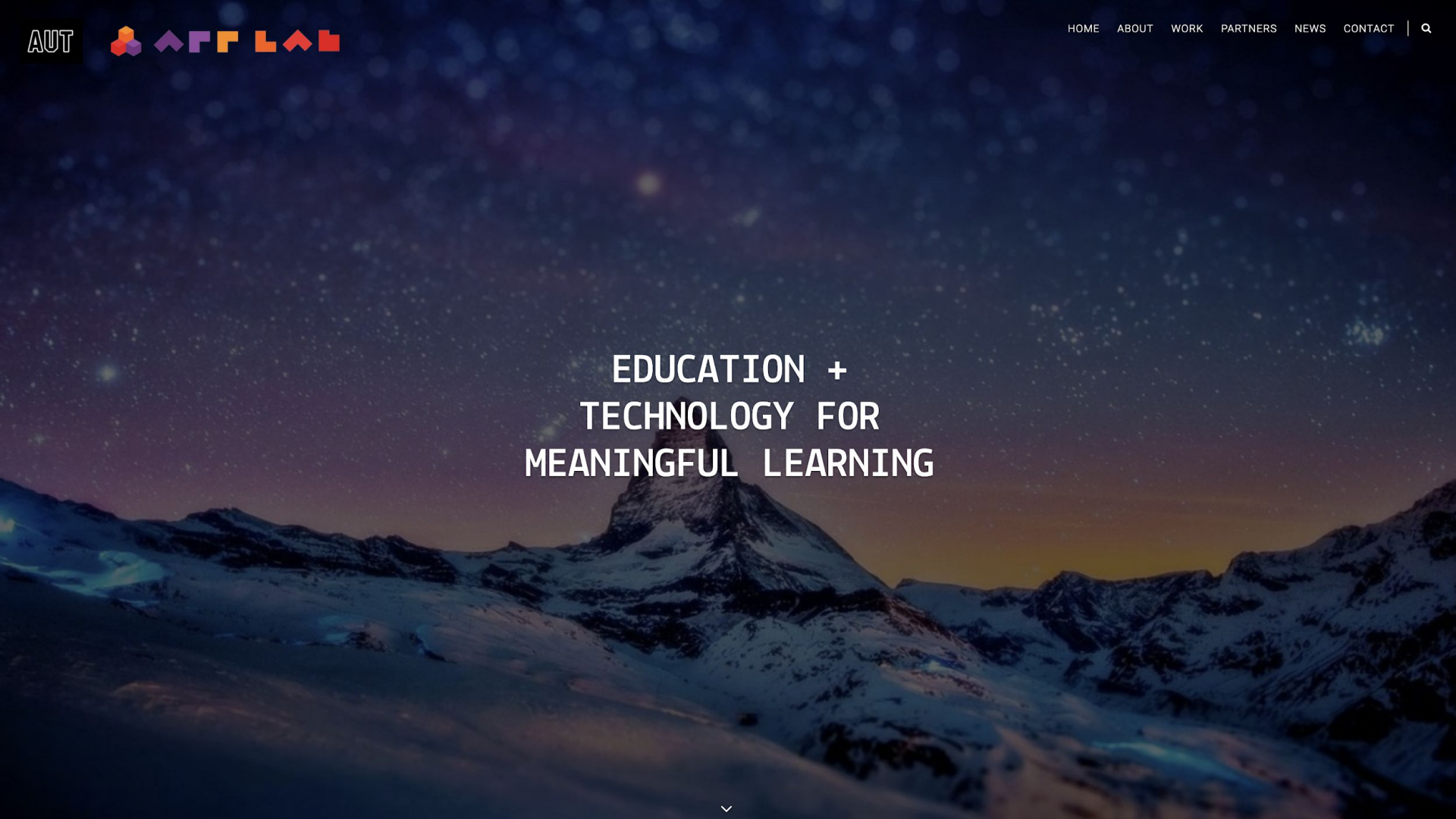
Exploring Mixed Reality (XR) in Education

Claudio Aguayo
Auckland University of Technology

#EDUC90970 Online Seminar, CSHE, University of Melbourne, 19 April 2021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MEANINGFUL LEARNING


New digital technologies can enhance learning experiences across all educational levels and contexts

Immersive Technologies

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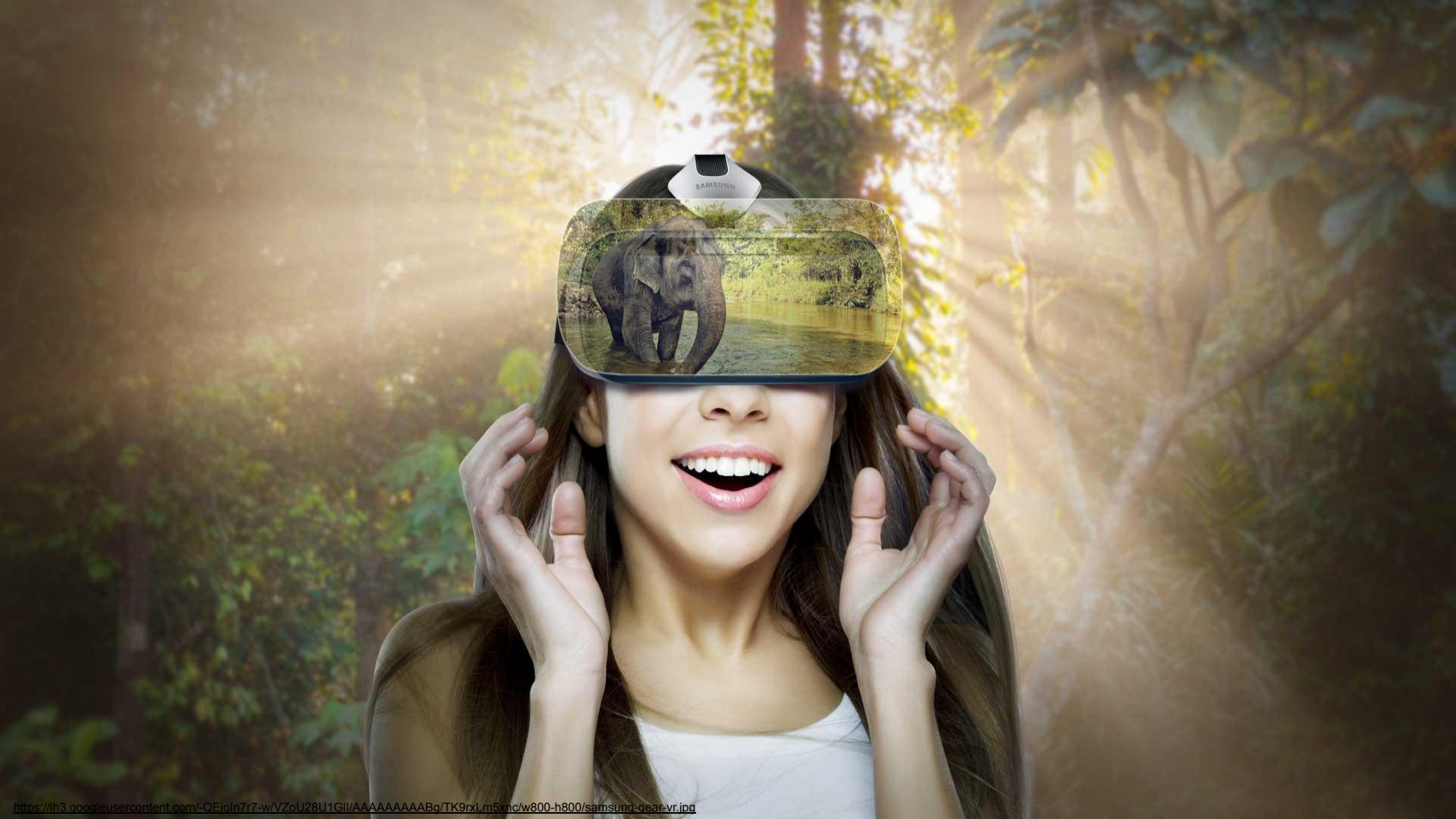
Immersive Technology

Immersive technology refers to technology that attempts to emulate a physical world through a digital or simulated reality by creating a sense of immersion or ‘deep cognitive involvement’



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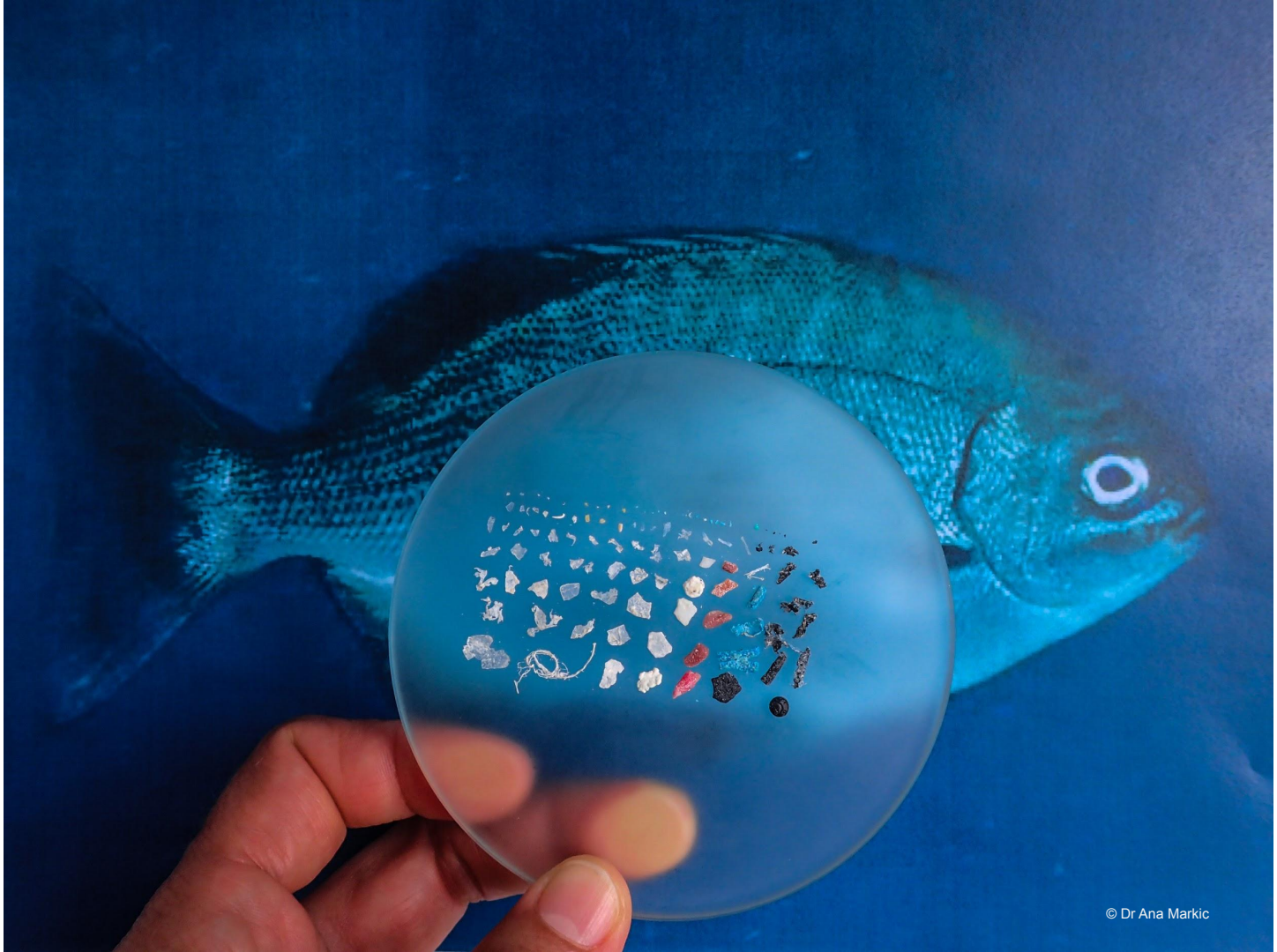
Virtual Reality (VR)

Virtual Reality involves the use of a computer to create an interactive immersive experience via some form of head mounted display (HMD) unit


Google

Augmented Reality (AR)

Augmented Reality is the overlaying of digital information upon a view of the real world environment using the combination of a digital camera and a viewing screen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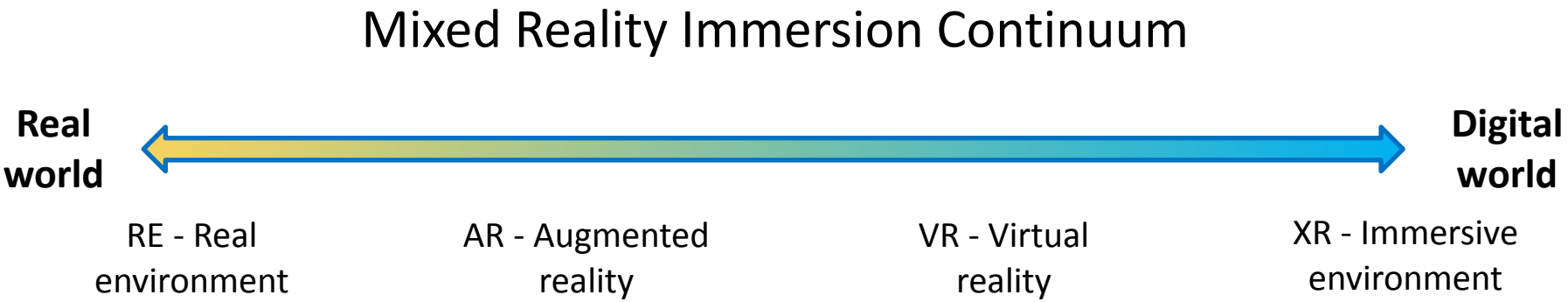
Mixed Reality (MR/XR)

Mixed Reality refers to the merging of real and virtual worlds with different degrees of immersion within a **Virtuality Continuum**

Milgram, P., & Kishino, F. (1994). A Taxonomy of Mixed Reality Visual Displays. *IEICE Transactions on Information Systems , 77*(12).

Mixed Reality (MR/XR)



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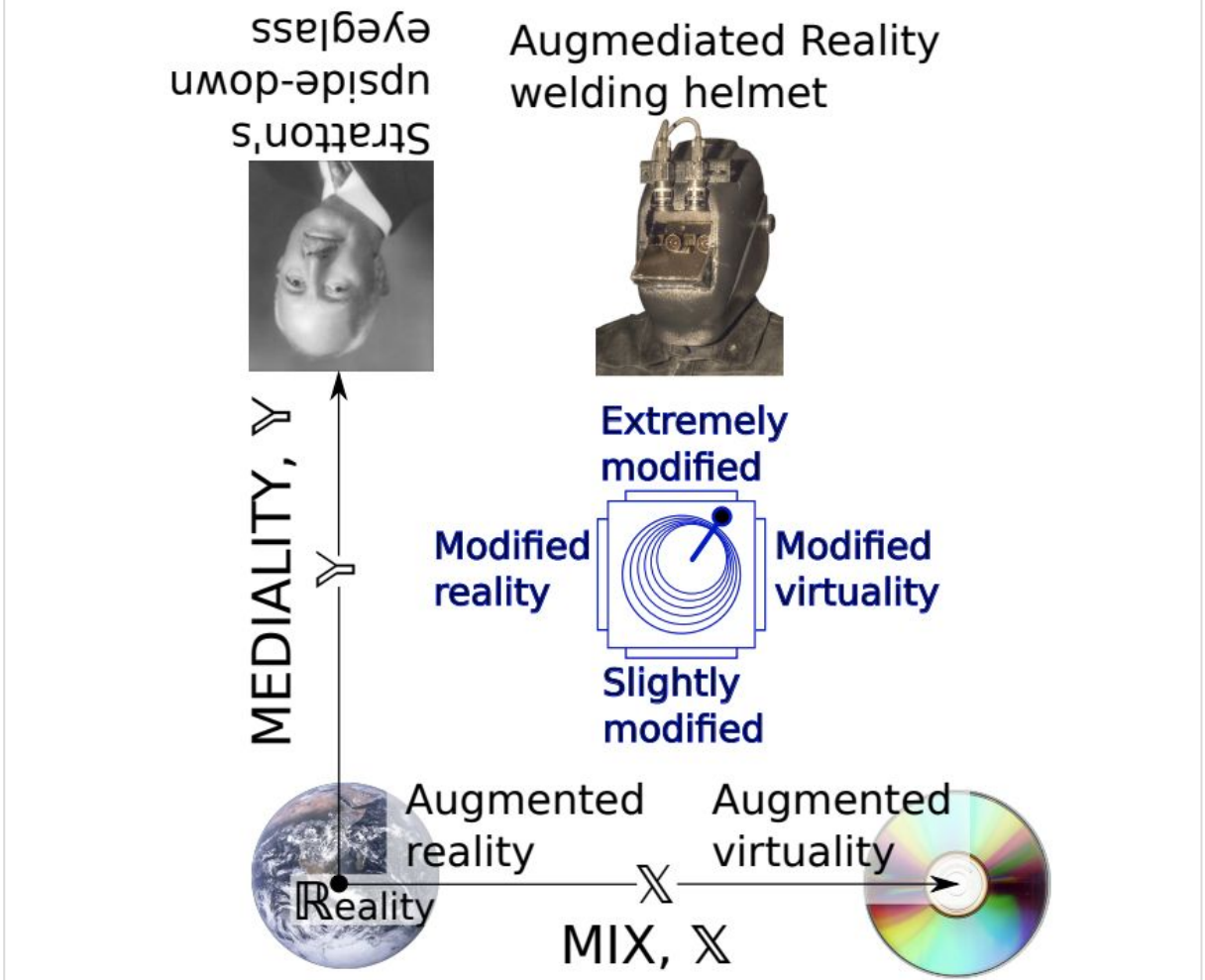

Mann, S., Furness, T., Yuan, Y., Iorio, J., & Wang, Z. (2018). All reality: Virtual, augmented, mixed (x), mediated (x, y), and multimediated reality. *arXiv preprint arXiv:1804.08386*.

eXtended Reality (XR): The term eXtended Reality (XR) was coined to refer to all of the points along the MR continuum including the endpoints of the Real World and Virtual Reality. The figure below shows the Reality-Virtuality spectrum and the relationship between AR/VR/MR/XR. In this document we use the term XR to refer to AR/VR in general.

The Reality-Virtuality Spectrum

FROM ‘TOOL’ TO ‘CONTEXT’

From ‘tool’ to ‘context’

Up until recently, learning affordances (possibilities) offered by immersive digital technology in education, such as AR and VR, were addressed and **considered in isolation** in educational practice.

From ‘tool’ to ‘context’

Today, the focus is on **creating contextual and authentic learning environments** where the digital, the real and the human come together in a shared action along a digital continuum

XR in Education – A new paradigm

XR in Education can be conceived in many ways, from multisensorial dimensions, to intelligent platforms and tools, to the embodiment of the experience in an interconnected learning ecosystem engaging different modes of perceptions

AppLab XR R&D

Going beyond software, hardware and tools to consider how to best design authentic user-centric XR learning environments.

Focus on perception, cognition, aesthetics, emotions, haptics, embodiment, context (space), situations (time), culture, etc. in promoting learning

APPLAB CASE STUDIES

www.otukapua.nz

Reality Browser Tree

Live data input to change the tree in various ways:

- Traffic data from Auckland Transport
- Weather Data from NIWA servers

Tree animations:

- Change leaves colour
- Change leaves movement
- Change Humidity level

Reality Browser Tree

Live data input to change the tree in various ways:

- Traffic data from Auckland Transport
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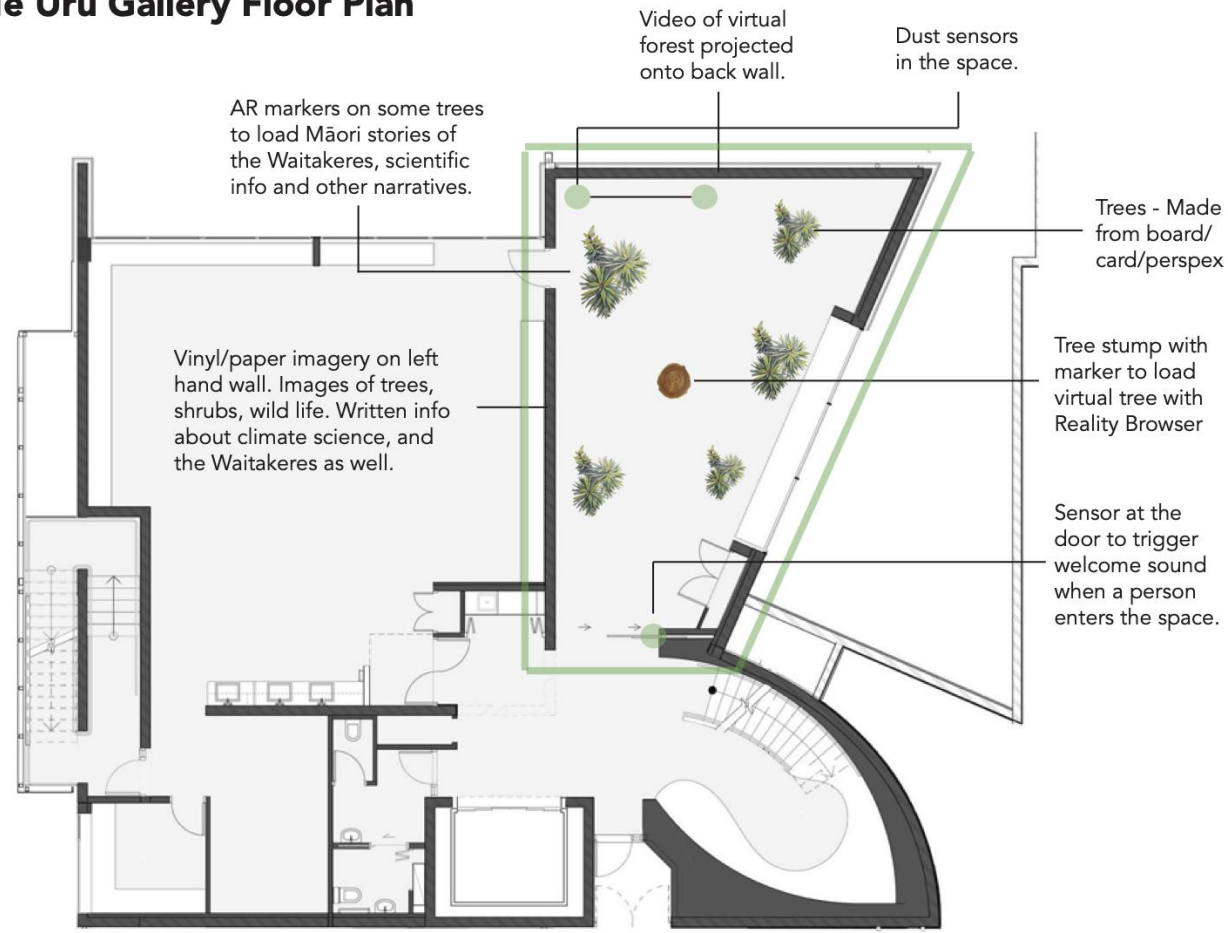
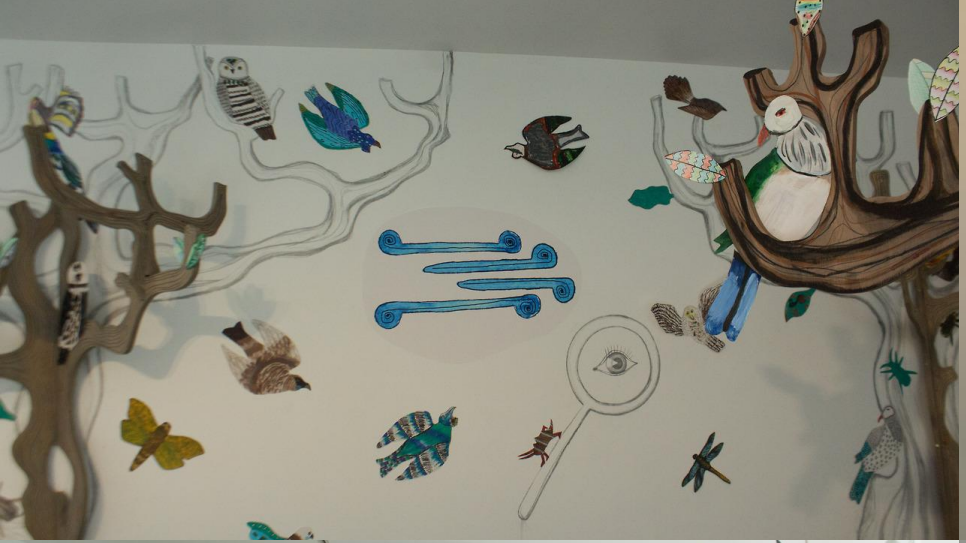
Te Uru Gallery Floor Plan



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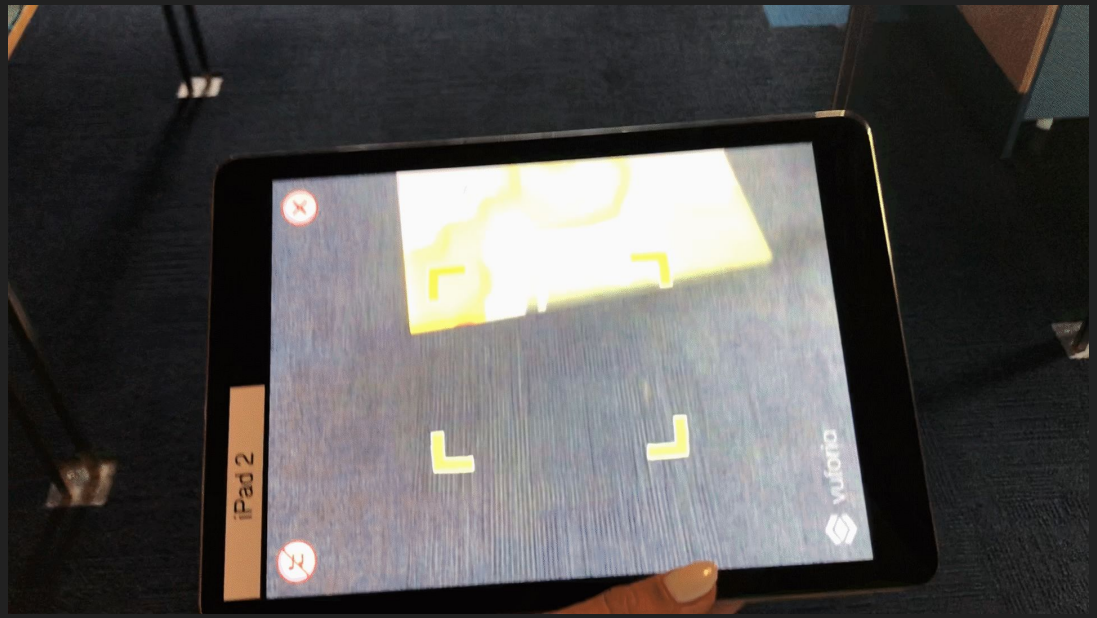
PIPI'S WORLD

Mixed Reality Immersion Continuum

RE - Real environment	AR - Augmented reality		VR - Virtual reality		XR - Immersive environment
Goat Island snorkelling	**Kelp forest**	**Goat Island REEF website**	**Pipi's world AR app**	**QR codes 360 VR**	**Pipi's VR adventures**
Real world hands-on experience	Haptic Plastic focus Colouring	Focal point Pre-visit Local info	Lobster march Food web Plastic poster Ocean acidification	Land, underwater & aerial 360 cardboard tour	Fully immersive virtual reality experience

Pipi's World XR



Pipi's World XR


Pipi's World XR

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ASSOCIATION FOR LEARNING TECHNOLOGY ALT

ORIGINAL RESEARCH ARTICLE

A Framework for Mixed Reality Free-Choice, Self-Determined Learning

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Received: 14 October 2019; Revised: 26 December 2019; Accepted: 8 January 2020; Published: 9 March 2020

In this article, we present a theoretical framework for mixed reality (MR/XR) self-determined learning to enhance ecological literacy in free-choice educational settings. The framework emerged from a research study in New Zealand which aimed to explore how learning experiences which incorporate mobile technologies within free-choice learning settings can be designed to enhance learner development of marine ecological literacy. An understanding of how mobile technology

Mixed Reality Immersion Continuum

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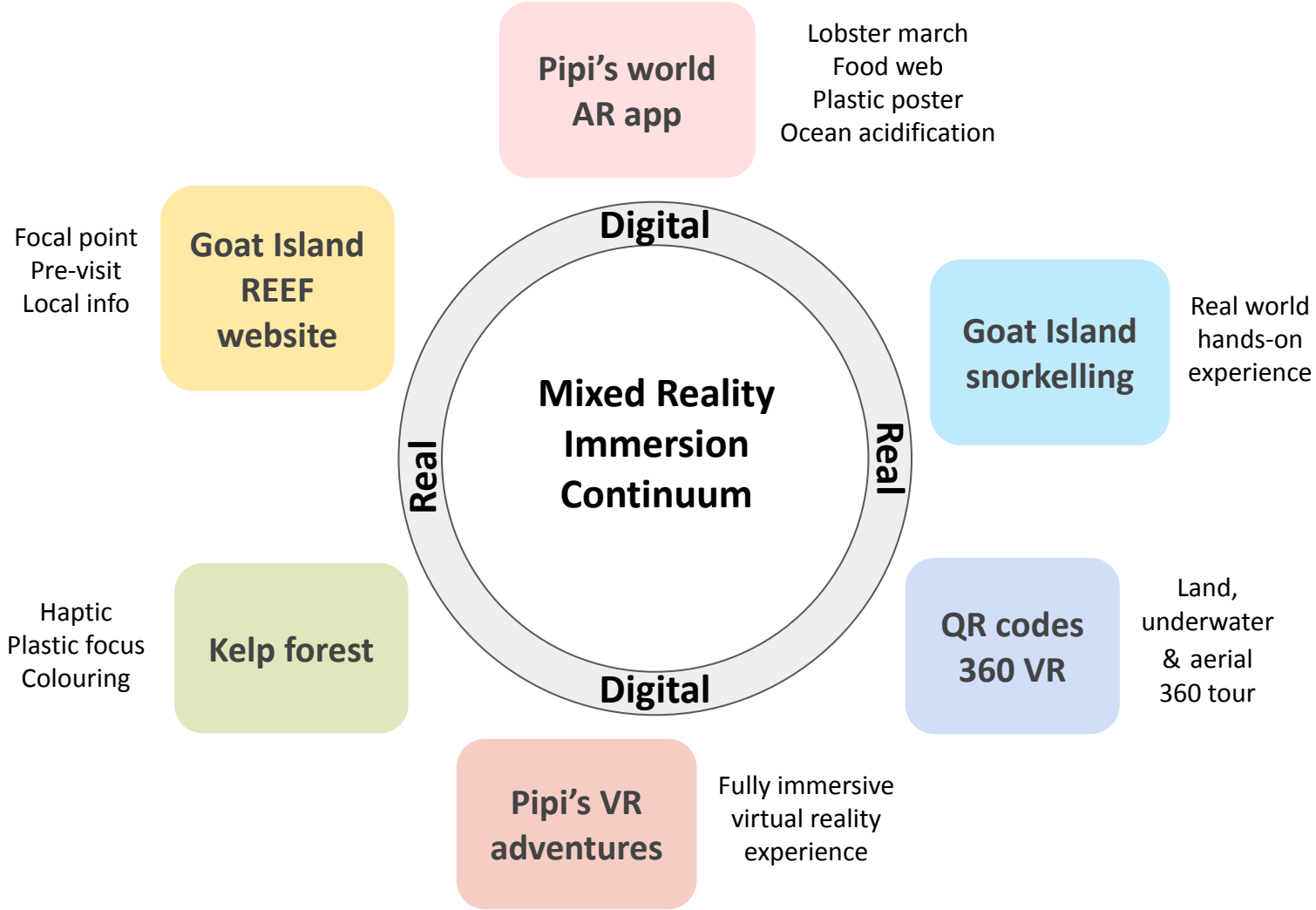
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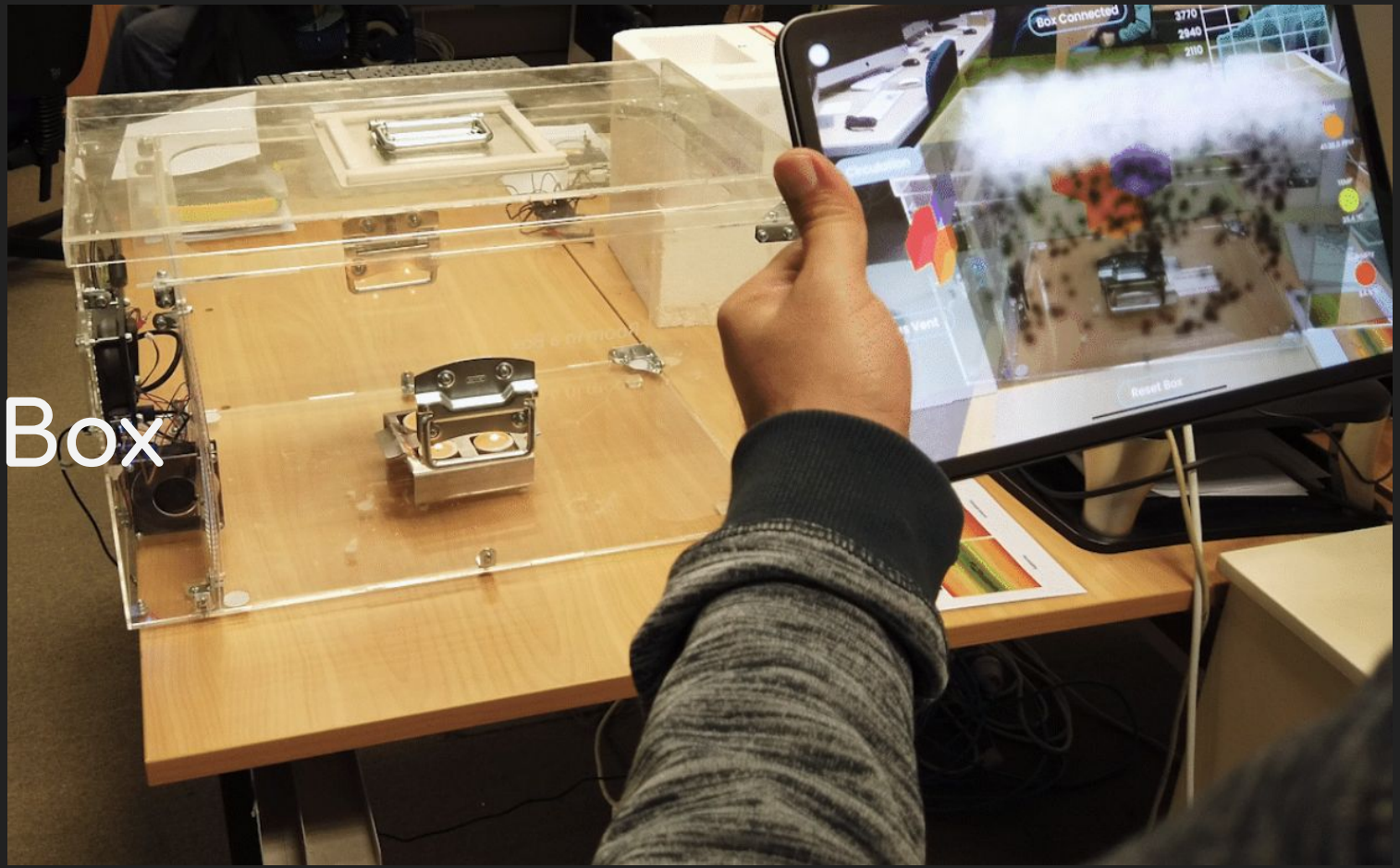
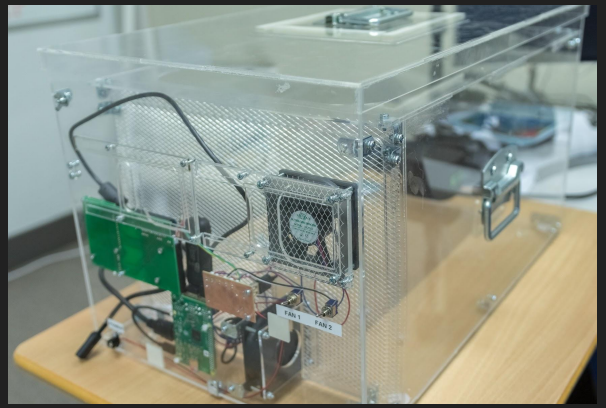
AirBox

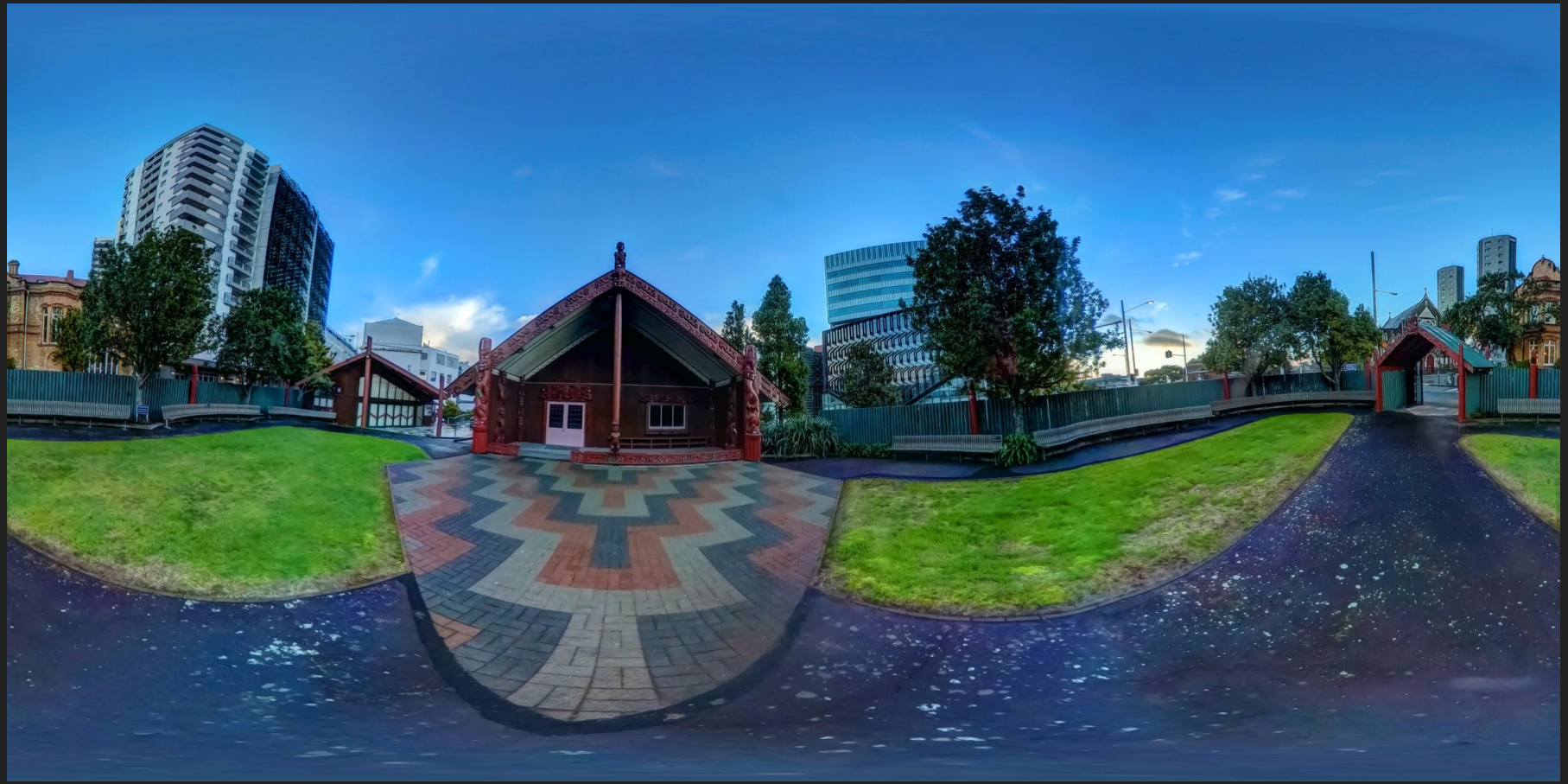


The NIWA AirBox AR



An air science project using a physical experimental box connected to an AR simulator to visualise what happens inside the AirBox

Cultural Heritage – Virtual Marae



The Cultural Heritage Gamification


MESH360
XR Simulation in
Paramedicine
Education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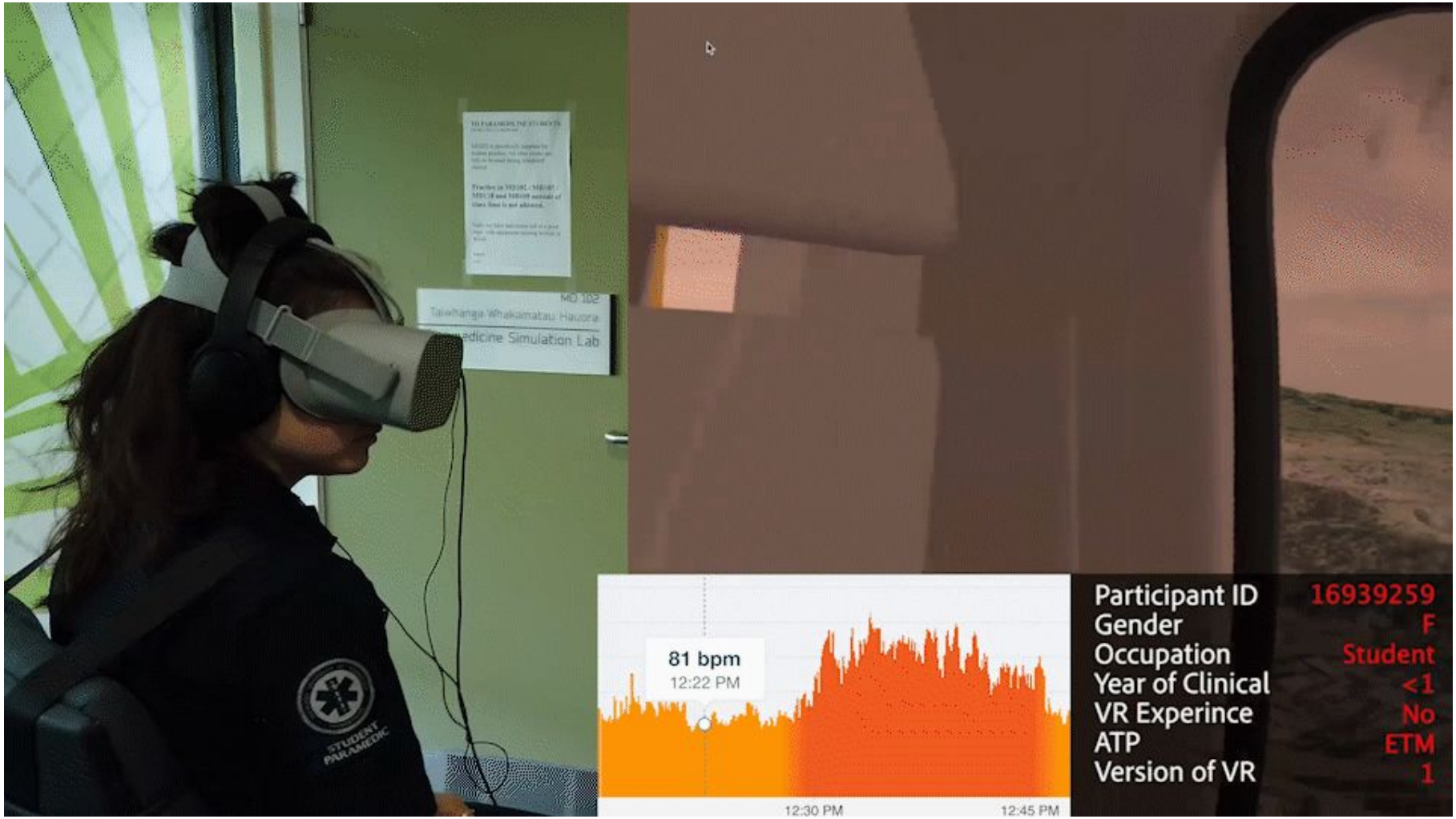
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12:22 PM
12:30 PM
12:45 PM
Participant ID 16939259
Gender F
Occupation Student
Year of Clinical <1
VR Experince No
ATP ETM
Version of VR 1

Design principles for an emerging medium:

Exploring embodied interaction for Mixed Reality

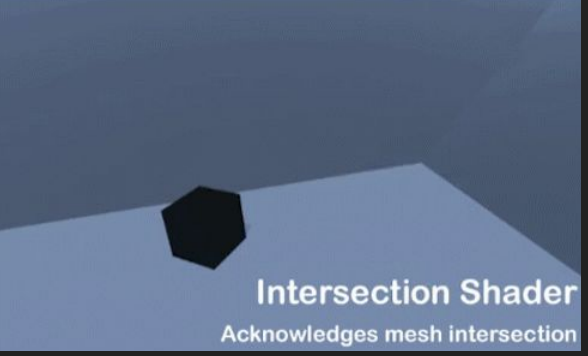
Ali Taheri, PhD Research

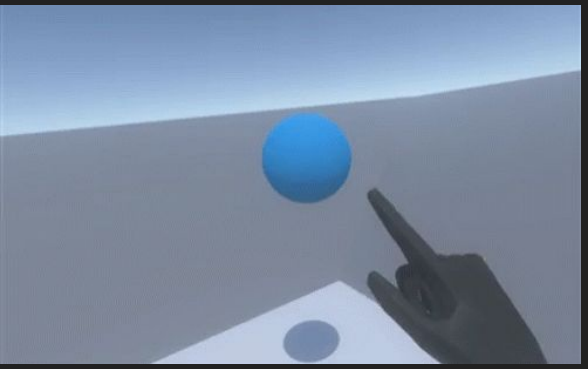
Supervisors: Claudio Aguayo & Stanley Frielick

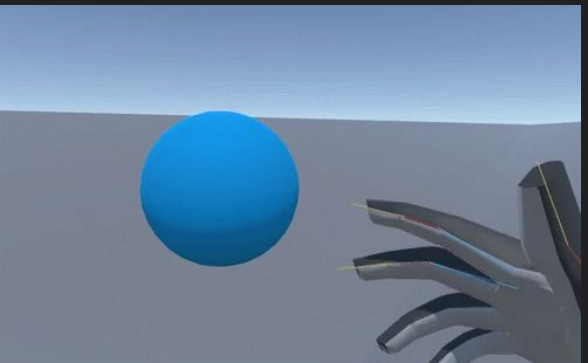

Prepare yourself for the future of work.

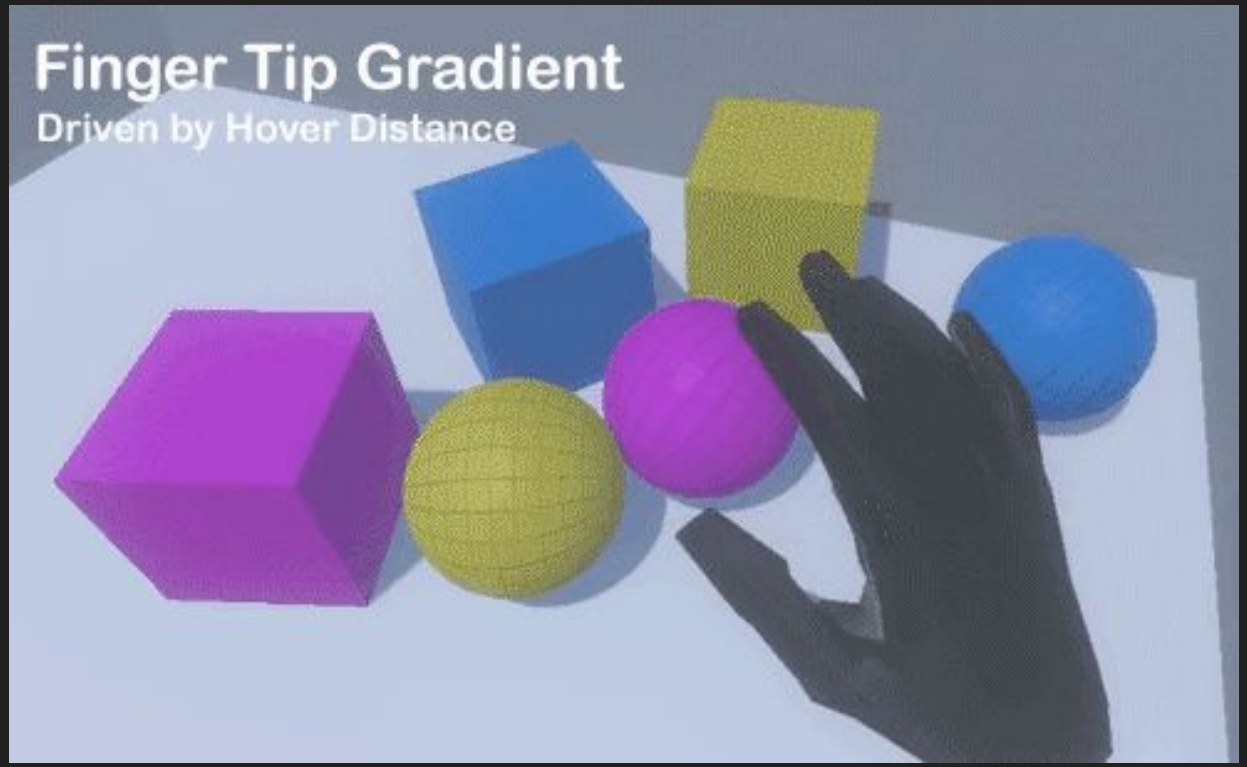

Lower Mantle
Outer Core

Haptic Visuality Interaction









Jin Hong, PhD research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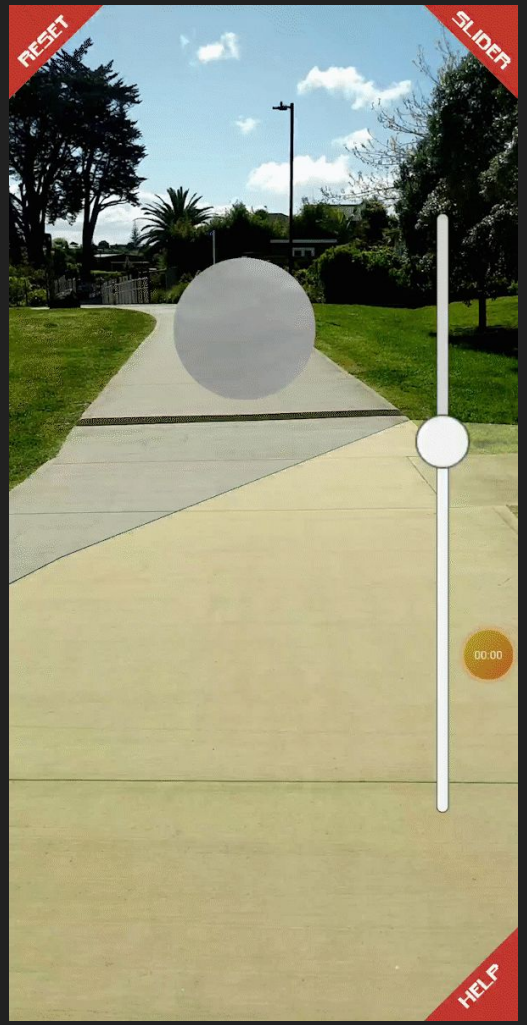
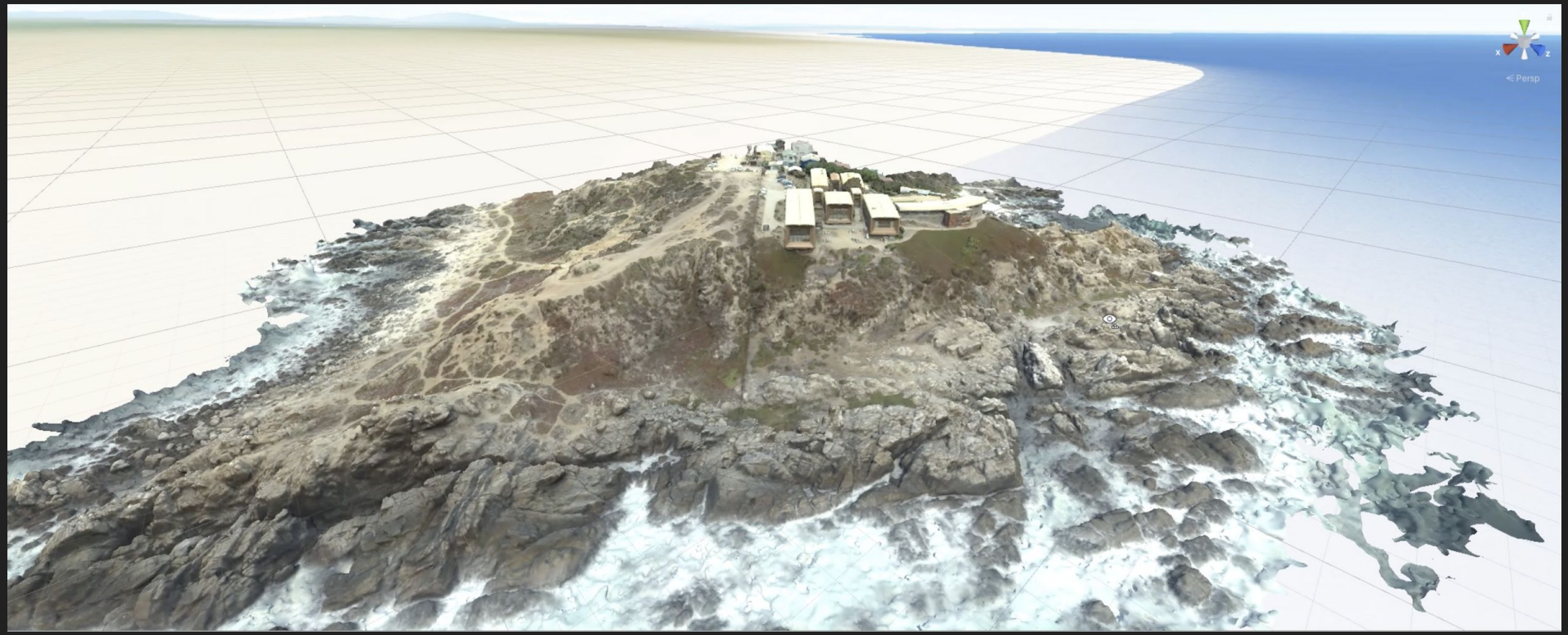


XR Portal

Play

EXPLORA XR Chile



EXPLORA XR Chile

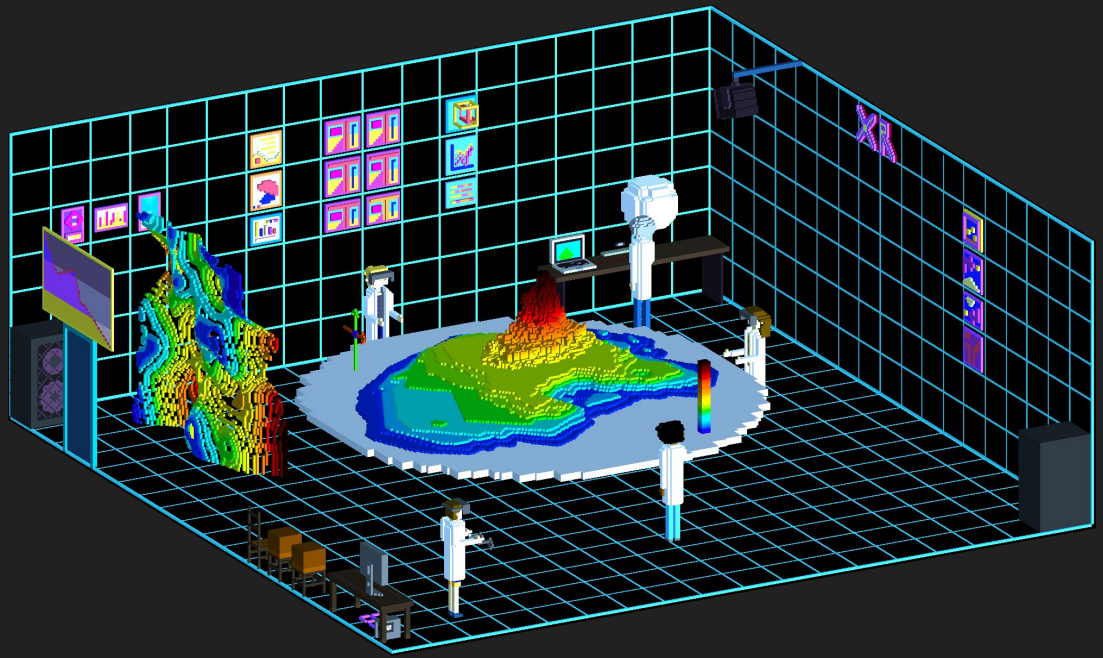
AUT Health Futures

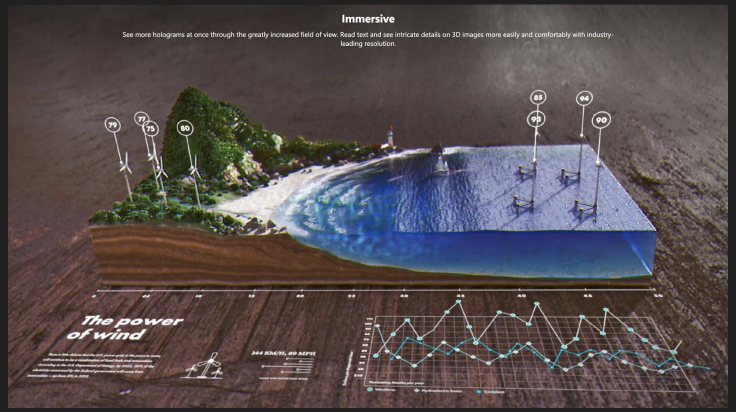
Rethinking the future of Māori community health with digital media and warm data

Factors and issues contributing to ‘wicked problem’

- Lack of awareness of relationship between environmental health and human health.
- Access: Unable to connect to primary care within community. Applies to central government services, health and social services.
- Digital inclusion: everyday digital tools are luxury items in Wairoa for elderly, remotely located and vulnerable community members.
- Environmental issues: Wairoa means ”Long Water” it is the lifeblood of the district but is in an unhealthy state.
- Absence of river health data and the impact on traditional fish, plants and food sources.
- Colonisation: The ordeal and accumulated trauma have induced further illnesses present in Māori today.
- Potential solutions and innovations stretch beyond clinical or traditional health fields and require new inclusive approaches that acknowledge, recognize and uplift mātauranga Māori.

AUT Health Futures
Ecological Map





Summary

- Immersive technology can lead to new ways of Learning for the Future
- Learning experiences using AR, VR and XR can be shaped to be authentic and context-specific
- XR environments can provide adaptable and flexible experiences to suit different users

Summary

XR as an emerging paradigm in Education invites us to consider new ways of thinking in designing technology-enhanced learning affordances. The challenge remains in grounding such epistemological and technological innovation into authentic, contextual, and tangible practice.

AUT

TE WĀNANGA ARONUI
O TĀMAKI MAKAU RAU

Thank you

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