# Designing mobile learning in education outside the classroom to enhance marine ecological literacy

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# Project overview

- Teaching and Learning Research Initiative (TLRI) fund

- 2 year baseline/designed intervention/evaluation (2017-2018)

- 1 teacher and her senior primary students and parents

- Goat Island Marine Reserve + Marine Discovery Centre (MDC)

Marine Ecological Literacy

Mobile Learning

+

Education Outside the Classroom

# A conundrum

- Mobile devices are valued learning tools in classrooms, and mobile technologies are offering a range of learning options

- But EOTC promotes learning in real contexts

- Could mobile learning affordances complement learning through EOTC?

**Research Question**

How can EOTC be designed to incorporate mobile learning technologies to enhance learner development of marine ecological literacy?

# Aim

To examine if a mobile learning framework (using BYOD) can enhance marine ecological literacy outcomes for students and parents in the context of the GIMDC
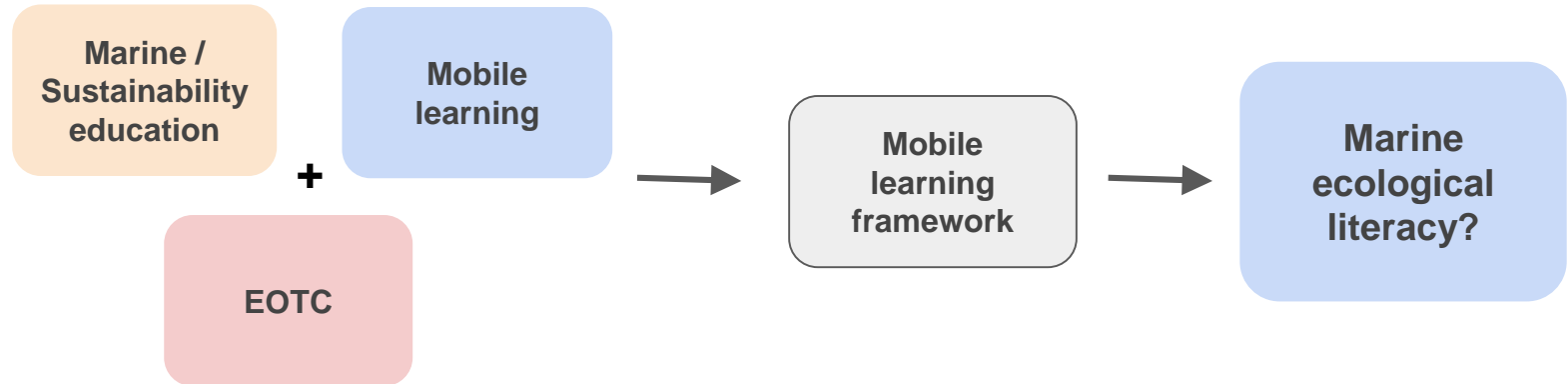
**Phase One**

Assessment of ecological literacy in the delivery of a Marine Reserves Unit to the class (March 2017)

- Pre visit survey

- Goat Island visit observations (snorkel + MDC)

- Post visit survey and interviews
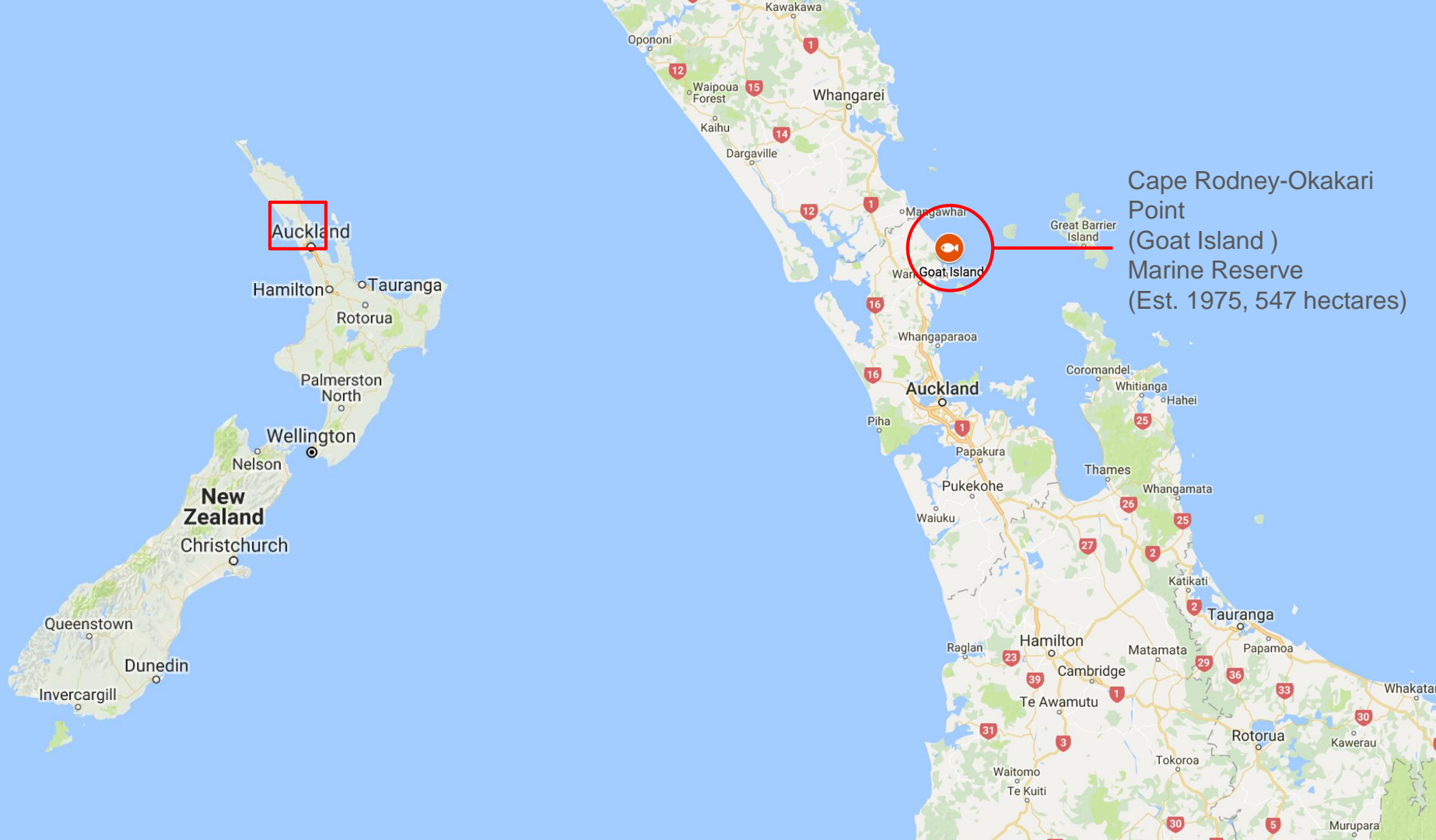
Cape Rodney-Okakari Point
(Goat Island )
Marine Reserve
(Est. 1975, 547 hectares)

# The visit (EOTC)

- Students enjoyed, and were engaged during, both the snorkelling and visit to the MDC, especially the close-up, interactive elements with wildlife

- The teacher, school and parents highly valued the EOTC opportunities

# Post-visit / Unit findings

- Students felt they had learnt everything on the trip and were un-motivated to learn more once back in the classroom, and were not able to provide detail about any subsequent classroom learning

- Students showed small knowledge gains but little change in pro-environmental attitudes or behaviour at the end of the unit

- Students, the teacher and parents were supportive of using mobile devices for learning in the unit, but did not want the devices to detract from the experiential opportunities during the visit

# Phase 2 – BYOD Framework

## Co-development of mobile learning framework (REEF)

- Informed by Phase 1 findings

- Informed by theory: **BYOD, heutagogy, sustainability & marine ed, EOTC, AR/VR/MR/RR, social media reinforcement, etc.**)

- Design and construction of mobile resources to support the repeat unit in March 2018

# Phase Two

Co-development of mobile learning (BYOD) framework by the REEF (Research into Ecoliteracy Enhancement Forum)



(July - October)    (November - February)    (Phase 3 March 2018)
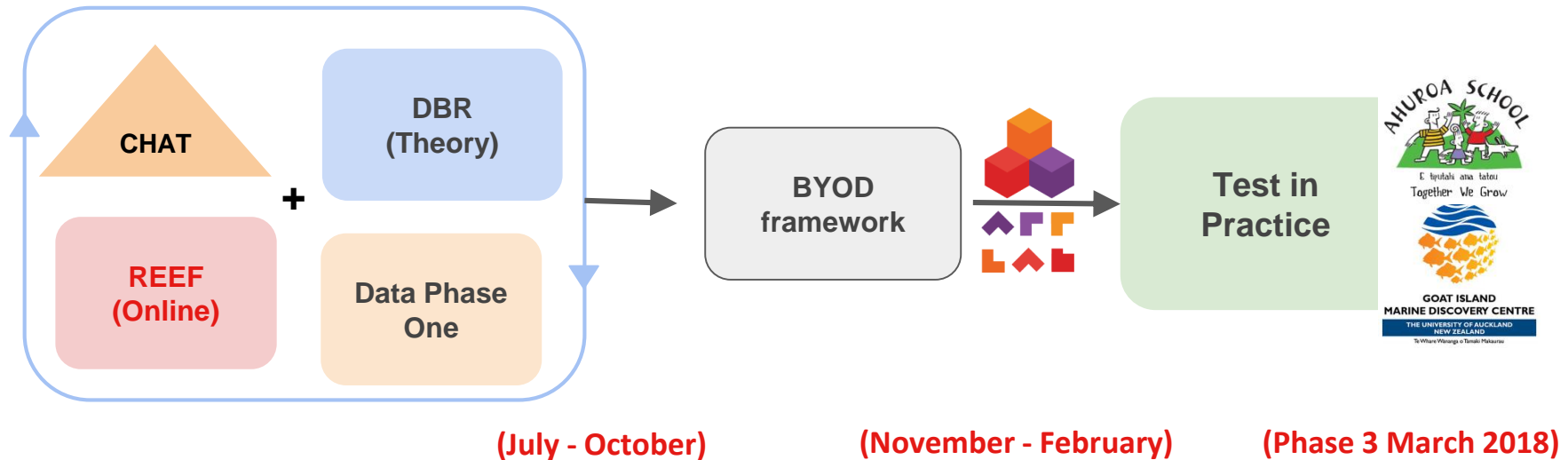
**7 members · Private**

# GIREEF – Goat Island REEF Online Community

This Google+ Community is the Online space for the TLRI Research into Ecoliteracy Enhancement Forum – The #GIREEF

**MODERATE**

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What do you want to share?

**Claudio Aguayo** Owner ▸ Discussion ⌄

UPDATED POST (with working link!)

Check out the video from the GIMDC visit by Ahuroa School (March 2017) the App Lab video team produced for us! A good way to remind us the dynamics that occur during a school visit to the Marine Reserve and Visitor Centre.

▶

**TLRI REEF - Visit One video**

+1   1

**Chris Eames** Moderator                    2w
▸ Marine Science & Conservation ⌄

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**Claudio Aguayo** Owner                      📌
▸ **Ecological Literacy development** ⌄

Thanks to all for contributing to the discussions around 'Marine Education & Conservation', specially to Guest Moderators +Tim Haggitt and +Angela Rapson!
We got some really good feedback for the framework :) !

Now we move on to the second forthrightly topic: 'Ecological Literacy Development' (4 Sep - 17 Sep). Guest Moderators: +Chris Eames & myself

•••

+1                                              💬 4

**Chris Eames:** Nice thinking Jessica and Claudio. Those ideas could certainly help create hooks for being ready to learn when...

**Thom Cochrane** Moderator                   1w
▸ **Mobile Learning possibilities** ⌄

Australia launches shark drones to protect beaches http://flip.it/_X78Kg
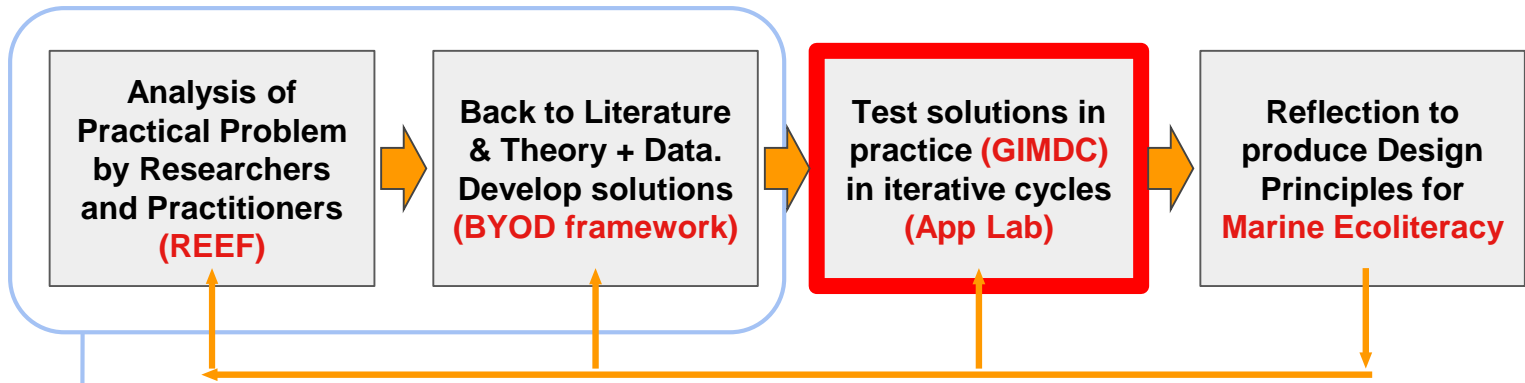
Flipboard on Flipboard

WARNING

# BYOD framework

There are many elements. Here are some:
- Marine reserves are crucial for ecological interactions e.g. food webs snapper/kina that support sustainable fisheries
- Holistic approaches that view marine reserves as systems that connect the natural environment with society and its culture and economy are important
- The visit should allow **freedom to experience** but also have some focus to **scaffold learning**, and to promote discussions between learners (social learning)

# BYOD framework

- Learning needs to be reinforced **post-visit** to deepen knowledge, clarify attitudes and support action-taking
- **User-informed** design should guide the design of affordances to promote meaningful learning
- An authentic, integrated, and scaffolded experience is critical for the success of mobile learning
- **Access** to technology (e.g. WiFi connectivity and IT infrastructure) and staff **Professional Development** are critical for the success of mobile learning initiatives at the institutional level

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Analysis of          Back to Literature      Test solutions in        Reflection to
Practical Problem    & Theory + Data.        practice (GIMDC)         produce Design
by Researchers       Develop solutions       in iterative cycles      Principles for
and Practitioners    (BYOD framework)        (App Lab)                Marine Ecoliteracy
(REEF)
```

**DBR: Reiterative cycles of refinement of problems, solutions and methods**

**BYOD framework**

**CHAT**    **DBR**

+

**REEF (Online)**    **Data Phase One**
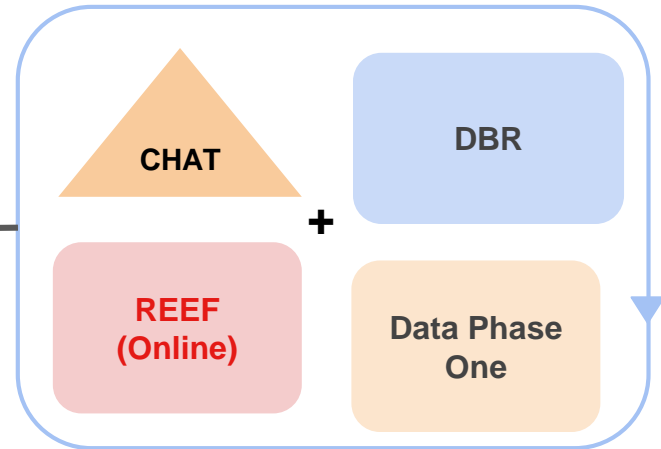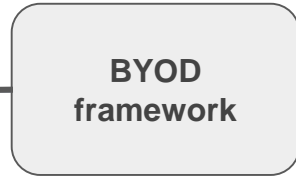
## Phase 3 – March-June 2018

Re-assessment of ecological literacy in the same Marine Reserve Unit using the mobile learning framework

- Pre visit survey

- Visit + Follow-up
**(social media + classroom MR + co-constructed VR)**

- Post visit and post unit interviews

# Mobile-enhanced visit to the GIMDC

## Digital Continuum / Mixed Reality (MR)

**Analogue** ←——————————————————→ **Digital**

RE - Real Environment

AR - Augmented Reality

AV - Augmented Virtuality

VR - Virtual Reality

**Kelp Forest**

**Goat Island REEF website**

**Pipi's World AR app**

**QR Codes / 360 VR**

**Pipi's Adventures VR**

Plastic focus
Colouring

Focal point
Pre-visit
Local Info

Lobster March
Food Web
Plastic Poster
Ocean Acidification

Land
Underwater
Aerial
360 Cardboard
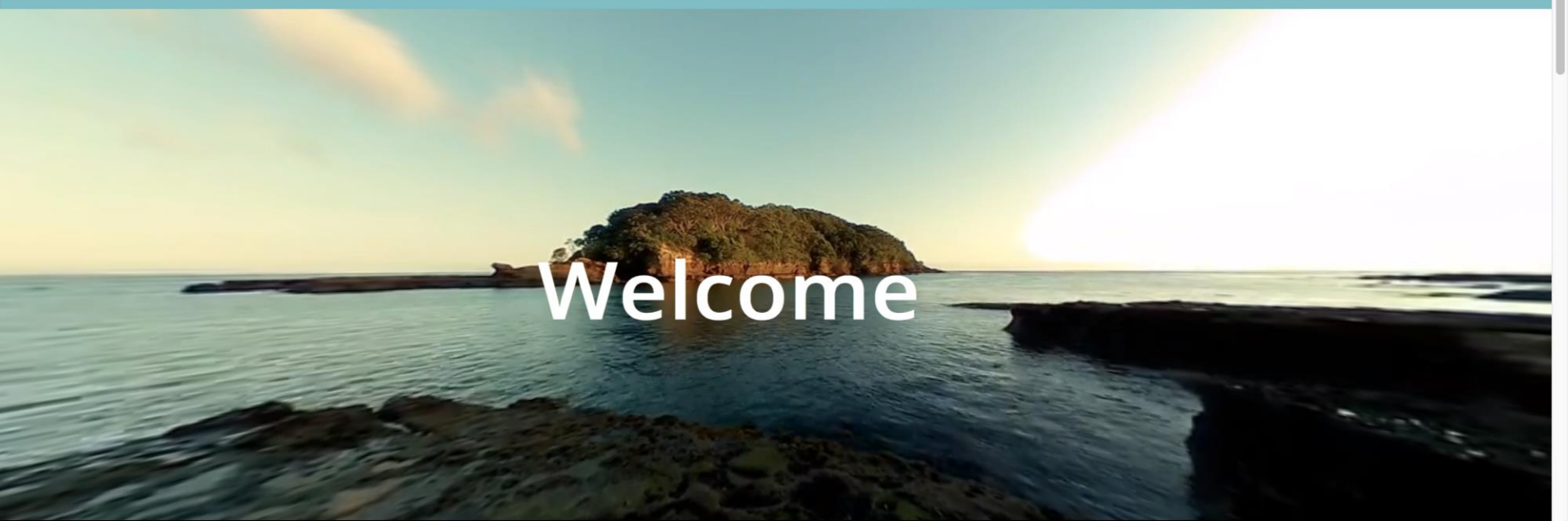
Fully immersive
Virtual Reality

# GOAT ISLAND REEF

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# Welcome

50% of plastic we use, we use once and throw away

Pipi's World

Hi there!
My name's Pipi and
welcome to my world!

Skip                    Next

Augmented Reality – the crayfish march

Augmented Reality – food web

# Augmented Reality – social learning

QR Code – 360 videos (air, land, underwater) 🐟

Virtual Reality – Pipi's adventures

# 'Real' Reality – the Kelp forest



KŌ-RIMURIMU

'To be covered in seaweed'

You are standing in a giant kelp forest - The garden of Tangaroa (god of the sea).

There is a problem in this environment though... Plastic rubbish from people has found its way into the kelp.

## We need your help to clean up this mess.

Step 1. Take the plastic rubbish out of the kelp and put it into the recycling bins located in a different part of the Discovery centre (HINT: Look for a big fish covered in plastic).

Step 2. Draw and colour in the cardboard fish and other sea life. Stick them back into the forest to make the eco system healthy again. Don't forget to do both sides.

Step 3. Scan the QR code markers with a QR code scanner on your device to see plankton living in the forest.

# Findings - EOTC

- Students were highly engaged with the VR and AR components.

- BUT they also still really enjoyed the real life exhibits such as the microscope and touch tank, and they enjoyed the snorkelling the most!

# Findings - Heutagogy

- Students were **actively learning** during both the DC visit and the snorkelling

- The DC visit exhibited **elements of free choice learning** as students pursued their interests

- At the DC and afterwards at school, **students directed their own learning** with guidance

# Mobile learning (mL)

- Teacher, parents and DC educators all agreed that **mL** has great potential for learning if used appropriately

- All also agreed that **mL** should only be used in the DC and not in the outdoors where sensory learning is important

- User-informed design worked well – students liked Pipi (but she was perhaps too cartoonish), and the **mL** options integrated well with the DC focus

# Mixed Reality

- This was seen to support learning that was authentic, sensorial, integrated and scaffolded
- The **Kelp Forest** was fun and memorable, and was replicated in class leading to strong learning outcomes.

Post-Visit Reinforcement: Classroom MR

# Learning outcomes - Ecoliteracy

- Importance of marine reserves - students demonstrated some knowledge and values development and indicated some motivation to act

- Importance of interdependence - students demonstrated good knowledge and values development and indicated some motivation to act

I only drain rain

"UNLESS someone like you cares a whole awful lot, nothing is going to get better. It's not."

# THANK YOU!
## Questions?

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- Claudio Aguayo – claudio.aguayo@aut.ac.nz

- Jessica Hanlon – jhanlon@ahuroa.school.nz

- Tim Haggitt – t.haggitt@auckland.ac.nz