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)
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 unmotivated 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)
GIREEF – Goat Island REEF Online Community

This Google+ Community is the Online space for the TLRI Research into Ecological Literacy Enhancement Forum – The #GIREEF
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
Analysis of Practical Problem by Researchers and Practitioners (REEF)

Back to Literature & Theory + Data. Develop solutions (BYOD framework)

Test solutions in practice (GIMDC) in iterative cycles (App Lab)

Reflection to produce Design Principles for Marine Ecoliteracy

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

- RE - Real Environment
  - Kelp Forest
    - Plastic focus Colouring

AR - Augmented Reality

- Goat Island REEF website
  - Focal point
  - Pre-visit
  - Local Info

- Pipi’s World AR app
  - Lobster March
  - Food Web
  - Plastic Poster
  - Ocean Acidification

AV - Augmented Virtuality

- QR Codes / 360 VR
  - Land
  - Underwater
  - Aerial
  - 360 Cardboard

VR - Virtual Reality

- Pipi’s Adventures VR
  - Fully immersive Virtual Reality

Mobile-enhanced visit to the GIMDC
Welcome

50% of plastic we use, we use once and throw away
Hi there!
My name's Pipi and welcome to my world!
Augmented Reality – the crayfish march

Do you see that? Those big male crayfish are marching off somewhere - let's follow them and see what's happening.
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

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 or phone to see plastic 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.
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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