Photo: (l) New Zealand Geographic
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GEEP GLOBAL 全球 ENVIRONMENTAL 環境 EDUCATION 教育 PARTNERSHIP 夥伴

Sharing ideas to create a more just and sustainable future through the power of environmental education

CASE STUDY

BLAKE New Zealand (NZ) Virtual Reality (VR): Using Virtual Reality to Educate about New Zealand's Marine Environment

CONTRIBUTORS

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BLAKE NZ

GEEP is a partnership of the U.S. Environmental Protection Agency, the Environmental Protection Administration of Taiwan, and the North American Association for Environmental Education.

International Environmental

Environmental Protection Administration, Executive Yuan

EPA United States Environmental Protection Agency

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BLAKE New Zealand (NZ) Virtual Reality (VR): Using Virtual Reality to Educate about New Zealand's Marine Environment

United Nations Sustainable Development Goals addressed

Overview

BLAKE NZ-VR connects young people to the marine environment through a school roadshow using virtual reality (VR) headsets and 360-degree underwater videos. The experience shows students (aged 11–13) what exists beneath the surface of our oceans through real-life video footage and teaches them about the significant challenges our marine environment faces.

Using technology that is attractive to our *rangatahi* (young people), NZ-VR provides students with an immersive and engaging learning experience that aims to give them a deeper sense of kaitiakitanga (guardianship) and educates them about what we can do to help protect the marine environment for future generations. NZ-VR aims to inspire students and provide an entry point for learning about and feeling connected to the marine environment, ultimately leading to action to improve ocean health, particularly related to overfishing, the impacts of runoff and sedimentation on water quality, and invasive species.

The BLAKE NZ-VR program is an effective tool for building ocean literacy among students and educators. Ocean literacy is defined simply as understanding the ocean's influence on you and your influence on the ocean. BLAKE NZ-VR can be used to teach the following Ocean Literacy Framework Principles:

- Ocean Literacy Principle #1: The Earth has one big ocean with many features.
- Ocean Literacy Principle #5: The ocean supports a great diversity of life and ecosystems.
- Ocean Literacy Principle #6: The ocean and humans are inextricably interconnected.

Ocean Literacy

An ocean-literate person understands:

- Essential principles and fundamental concepts of ocean science
- How to communicate about the ocean in a meaningful way
- How to make informed and responsible decisions regarding the ocean and its resources

OCEAN LITERACY NETWORK

Photo: New Zealand Geographic

Background

The health of our marine environment is in serious decline and facing significant environmental challenges due to human activities, including overfishing, pollution, and invasive species introduction (among other things).

Many people are unaware of the challenges that the ocean and marine environment face. Some people living in urban areas have become disconnected from the ocean and marine environment or have very little experience with it. Other people may not have access to the ocean and marine environment because of societal inequities, including poverty and other social issues. Ocean blindness is the term used to describe a lack of hands-on experience with what lies beneath the surface of our ocean. Sir Peter Blake, New Zealand yachtsman and Special Envoy for the UN Environment Programme, believed that if people truly experience the environment, they are far more inclined to take care of it. In keeping with this philosophy, at **BLAKE**, experiential learning is at the core of all our programmes, and NZ-VR is a way to deliver an immersive marine experience with mass reach. We do this by taking the ocean into the classroom.

NZ-VR was launched in early 2019 in partnership with **New Zealand Geographic**, which filmed the underwater sites and content. The footage is shot mainly in the Hauraki Gulf (a 4,000 km² marine park that lies in and around Auckland) and the northeastern coast of the North Island.

Approach

BLAKE employs several steps to ensure a rich experience for all learners, including both the learners and the teachers they reach.

Outreach:

- E-newsletters are circulated to targeted schools in Auckland and parts of the upper North Island, introducing and promoting the NZ-VR programme. Compelling imagery and video support the content.

Registration:

- Interested schools register online for the NZ-VR programme (sessions last one hour and schools can book up to four sessions per day).
- The NZ-VR programme is free, so it is accessible to all. However, schools are asked for a voluntary *koha* (donation) to help cover the programme cost.

Preparation:

- Registered teachers are contacted by the NZ-VR educators prior to their visit to confirm dates and times for the sessions.
- Prior to the session, teachers are given an overview of how the session will run, any technology requirements to assist the educators (e.g., a large screen and/or projector for a presentation), and how to set up the ideal classroom. For example, some schools choose to hold the sessions in a library or hall-style setting where children might be seated on the floor, whereas others may choose a traditional classroom where children are seated at desks or tables.

In the classroom:

- Our full-time environmental educators visit scheduled schools with a class set of VR headsets to deliver NZ-VR sessions.
- The educators begin the lesson with an introduction to BLAKE and by getting a sense of the experience the students have had with the marine environment. For example, students might be asked to raise their hands if they have been swimming or fishing in the ocean, been on a boat on the ocean, or been diving/snorkeling and experienced what's under the ocean.
- The session is an interactive combination of a visual PowerPoint, inclusive discussions, and questions about what they are learning and seeing, and watching a series of underwater VR videos through headsets controlled by educators.

Photo: BLAKE

- Each interactive experience is 5 to 10 minutes in length to keep the class engaged and moving. The experience involves footage of healthy marine ecosystems and those that have been degraded by human activity. During this time, our educators get children to discuss among themselves what they experienced—what they could see and hear. They are encouraged to share this with the educators and the rest of the class.
- The lessons conclude with a discussion about student suggestions on actions that can be taken to reduce the impacts.

Content:

- The overall aim of the lesson is to learn about the critical issues the marine environment faces and discuss what actions can be taken to address these issues. The areas of emphasis throughout the session are the impacts of overfishing, runoff and sedimentation, and invasive species. A new lesson on marine mammal society is currently in development and will be available February 2022.
- The videos show real, 360-degree footage of healthy, thriving marine ecosystems and species—shot in local marine reserves. Students "swim" with schools of snapper, trevally, and dolphins, while seeing sharks, whales, stingrays, and kelp forests up close.
- Students also experience unprotected marine areas shot in the Hauraki Gulf, which include barren underwater environments due to overfishing. The videos showcase the value and importance of protected marine areas and allow students to gain a basic understanding of food chains and the concept of trophic cascade. A trophic cascade is an ecological phenomenon triggered by species loss and a disruption in the ocean's food web, often resulting in dramatic changes in ecosystem structure and nutrient cycling.
- Students also experience environments that have been significantly degraded due to pollution, sedimentation, and invasive species.

Follow up:

- Each teacher receives a physical handout with information about where they can find online supplementary teacher resources for NZ-VR and further information about BLAKE and all programmes we offer.

Photo: New Zealand Geographic

Photo: BLAKE

Evaluation Plan

The evaluation plan for BLAKE NZ-VR is comprised of teacher surveys which are conducted following every session. Each participating school is sent a survey, which they are encouraged to share with every teacher whose classroom took part.

Survey content/questions:

1. Please select how much in agreement you are with each of the following statements, where one means strongly disagree and six means strongly agree. Any comments on these are welcome below.
    - I was satisfied with the NZ-VR experience.
    - I would recommend NZ-VR to a friend or colleague.
    - I would rebook NZ-VR to return to my school in 2022.
    - My students enjoyed the NZ-VR experience.
    - NZ-VR inspired my students to care for the environment.
    - The educators engaged well with the students.
    - The content was high quality.
    - Virtual reality is a good way to support teaching environmental education.
    - Communication prior to the session was clear and helpful.
    - The booking system was straightforward.
2. Have you used the NZ-VR teacher resources?
    - Yes.
    - Not yet, but I intend to.
    - No, I won't be using the resources.
    - I did not know about the resources.
3. Do you have any other comments or feedback on the teacher resources?
4. We've suggested a *koha* of $290 per day. Using the scale bar below, please indicate the extent to which you think this is a good value, where 1 is very poor and 10 is very good.
5. Do you have any final comments or suggestions to improve NZ-VR in the future?

"The NZ-VR ocean experience was incredible for both students and teachers! It made the plight of our marine environments tangible in a way we've never experienced before, opening up our eyes to a whole new world. This meant the students were more engaged in our follow-up discussion about human impacts on the environment, and the students were passionate about making a difference. It made our Oceans unit live, without leaving South Auckland."

– SCIENCE TEACHER, AORERE COLLEGE

Results and Outcomes

Survey results to date:

- An initial external evaluation undertaken after the first year of the programme indicated that the number of students "really interested" in protecting the ocean increased from 39% to 70% after experiencing NZ-VR; and following our classroom visit, **95% of teachers surveyed believed that NZ-VR provided an effective way to deliver environmental education.**
- The initial evaluation also indicated the programme was most impactful on Māori (indigenous New Zealanders) and/or Pasifika (people from other Pacific nations now living in New Zealand) students. The reason for this was the natural and deep cultural connection Māori and Pasifika people have to the moana (ocean). Living in urban Auckland, many of these students experienced a reduced or entirely lost connection to the coast. NZ-VR provided a re-entry point to engage with the ocean resulting in greater interest in and impact from the lesson. This has led us to focus delivery on schools with high Māori and Pasifika populations, and the anecdotal feedback we receive continues to support the findings of the initial evaluation.
- **91% of teachers** strongly agreed with the statement, ***"I was satisfied with the NZ-VR experience."***
- **93% of teachers** strongly agreed with the statement, ***"I would recommend NZ-VR to a friend or colleague."***
- **89% of teachers** strongly agreed with the statement, ***"The educators engaged well with the students."***
- **86% of teachers** strongly agreed with the statement, ***"Virtual reality is a good way to support teaching environmental education."***

To date, the survey results from teachers have been overwhelmingly positive, encouraging us to continue the NZ-VR sessions in the current format.

Program expansion outcomes

Since its launch in early 2019, demand for the programme from schools has grown—exceeding our ability to deliver. Our travelling NZ-VR educators are fully booked in advance for the entire length of each school term, reaching around 20,000 students annually throughout Auckland. Our aim now is to substantially grow the programme, and for the start of the 2022 school year we have expanded our capacity to deliver in Auckland and the upper North Island. We have also employed a new educator to deliver the programme in Christchurch, alongside a new delivery partner (Christchurch City Council). Later this year we intend to add capacity to deliver in Wellington and the lower North Island, by which time we hope to be able to reach over 50,000 students annually.

In 2021 we launched a version of NZ-VR suitable for Māori (indigenous New Zealanders) immersion schools, incorporating both *te reo* Māori (the Māori language) and a Māori worldview. This was driven by a desire to better deliver on the impact the programme can have on Māori students, as mentioned above.

BLAKE Explorers is our newest programme and a natural extension from NZ-VR. Educators noted that students from low-income urban communities frequently have very little experience with the ocean and often have social or financial barriers that prevented them from experiencing the ocean in person. This new programme gives students, who would not otherwise get the opportunity, the ability to explore our marine environment through activities such as snorkeling, surfing, nature trails, and other outdoor activities. Groups must have taken part in NZ-VR to be selected for BLAKE Explorers.

Photo: BLAKE

Lessons Learned

We have regularly heard from teachers that the programme can be highly engaging for students who often struggle to engage in "normal" class time. As a result, the teachers are provided an avenue through which they can continue the discussion with the students after our educators have left. All the videos are available online through the NZ Geographic website, and students can use computers or tablets to 'click and drag' the videos to further explore topics and issues of interest. This, combined with the teacher resources we make available, enables students to continue their learning experiences long after our educators leave.

The combination of technology with environmental sustainability as a subject is highly appealing to both schools and students, and as a result demand for the program is extremely high. It makes for a contemporary learning approach about a very relevant subject.

We have delivered the NZ-VR programme to all school-aged students—from Year 1 (aged 5) to Year 13 (aged 16–17). We discovered the classroom session, and its content, is ideally suited to Year 7–8 students (aged 11–13). Teachers have more flexibility in supplementing the curriculum during these years since formal external exams begin in the later years leaving less room for flexibility in delivering the curriculum.

Photo: New Zealand Geographic

"Students from low socio-economic communities using VR are able to experience phenomenon which they may struggle to or may never be able to experience. Teachers are always finding new ways of teaching to motivate and engage students in their learning. Since students of today are born in this digital era, VR offers visuals in the real world, and as a result it can increase engagement of students in productive learning in science. It can also motivate them to discuss and communicate their experiences."

– SENIOR SCHOOL ACADEMIC DEAN, AORERE COLLEGE

Resources

NZ-VR Teacher Resources offers a series of comprehensive online resources for teachers (or anyone) to download and share. Users can download a ZIP folder which includes a PowerPoint presentation, learning outcomes, and worksheets on a range of key topics:

- **Overfishing**
- **Marine ecosystems—food webs**
- **Marine ecosystems—habitat**
- **Marine reserves**
- **Pollution**
- **Mangroves and mussels**
- **Importance of the ocean to Māori**
- **How you can help**

These resources are high impact and action-oriented and intend to engage, educate, and empower students. They were developed to support the New Zealand curriculum by Cashmere High School science teacher Leith Cooper.

The virtual reality videos can also be accessed and viewed on any internet-capable device, including smartphones, iPads, Chromebooks, cardboard headsets, or computers.

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