



Activities for Educators

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The following are professional development activities designed to help environmental educators enhance their competencies in ocean literacy. These activities can be used with environmental educators of all levels, from aspiring educators, such as college students, to those currently active in the field. We encourage you to adapt and tailor these activities to best fit your specific audience. We also suggest that you research and use additional professional development opportunities for educators, such as those provided through online courses, museums, and aquariums. These are just a few suggestions on how to further engage your learners!



1. Localizing the principles of ocean literacy. The *Ocean Literacy Guide* outlines [seven essential principles of ocean science education](#) that are relevant globally. Organizations around the world are also developing localized guides for their surrounding marine systems, such as the [Bay of Bengal Literacy](#). Environmental educators around the world can also adapt existing principles and create new ones to reflect the local environment, local institutions, and traditional knowledge systems.

Ocean Literacy Principles

1. Earth has one big ocean with many features.
2. The ocean and life in the ocean shape the features of Earth.
3. The ocean is a major influence on weather and climate.
4. The ocean makes Earth habitable.
5. The ocean supports a great diversity of life and ecosystems.
6. The ocean and humans are inextricably interconnected.
7. The ocean is largely unexplored.

- Have your educators think individually or in small groups about how the ocean impacts their local town/city, biome, and watershed, as well as how these impacts affect the cultures that make up their communities. Help them determine what localized adaptations of the ocean literacy principles and concepts they think their communities need to know—regardless of their distance from the ocean. Their ideas may need to be especially creative if they are located far from the ocean, where ecological and social connections to the ocean may not be as obvious.
- In a large group, review these new or adapted principles, and discuss which of them can be most effective to foster students' ocean literacy and action.
- If your educators include school teachers, help them identify how any of the ocean literacy principles contribute to science learning or social learning standards in their state or country.



2. Sources of hope and inspiration. When we talk about the ocean, the narrative is often dominated by stories about climate change, biodiversity loss, overfishing, water acidification, coral bleaching, plastic pollution, and other challenging trends. Although it's important to understand the threats to marine biodiversity, it's also important to highlight in learning settings the many stories of ocean conservation and restoration that show the positive side of this work. Ask your learners to research stories of ocean literacy programs from around the world that: (1) foster collective stewardship action, such as beach cleanup events, (2) inspire communities and grassroots organizations to influence ocean-related policies and regulations, such as related to plastic use, or (3) help individuals change their behaviors to benefit the ocean, such as switching to diets that don't harm marine animals or only consuming sustainably sourced seafood. Share and discuss these stories as a whole or in small groups.

Here's a sample of internet resources:

- [Youth Ocean Conservation Summit](#)
- [Ocean Conservancy](#)
- [National Marine Sanctuary Foundation](#)
- [Monterey Bay Aquarium Seafood Watch](#)



3. Celebrating diversity. All classrooms and educational programs need to show a diversity of perspectives to help students best understand and protect ocean biodiversity. To acknowledge and celebrate the diversity of this field, ask your educators to find the names and biographies of scientists, social scientists, geographers, storytellers, community leaders, and other individuals who represent various genders, races, cultures, ethnicities, and other backgrounds. Have your learners explore how people representing a range of backgrounds and communities have advanced knowledge, public awareness, conservation science, community action, and policy-making related to the ocean. In addition, you can discuss with your learners how Indigenous knowledge systems have contributed to ocean sustainability and continue to help us understand more about how to protect our ocean. Here are some sites to get you started:

- [Black in Marine Science](#)
- [Minorities in Shark Sciences](#)
- [Tribal Marine Stewards Network](#)
- [Indigenous Aquaculture Collaborative](#)
- [Kua'aina Ulu 'Auamo](#)



4. Immersive learning experience. When educators begin to teach about the ocean in their classrooms or programs, it is useful to start by highlighting 2–3 ocean principles instead of covering them all at once. You can help educators explore one ocean literacy program and discuss which ocean literacy principles are playing the main role in this case study. For example, ask your learners to read the [BLAKE NZ Virtual Reality](#) case study about the use of virtual reality for marine environmental education, and watch the [sample VR videos on the New Zealand Geographic website](#). Then engage them in a group discussion based on these or other questions:

- How does the BLAKE NZ-VR program contribute to literacy principles 1, 5, and 6? Remind educators about all seven principles (see box on page 9) and decide which apply best.
- What other learning outcomes could this program foster? For example, outcomes related to students' learning and leadership, raising awareness in communities, or conservation action.
- Since virtual reality headsets are not available in all education settings, what other teaching approaches could help educators achieve similar learning outcomes with students that face barriers to access the ocean?



5. Marine educator networks. Educators can benefit from organizing or becoming part of existing professional networks that focus on marine and coastal ecosystems. The [Latin American Marine Educators Network \(RELATO\)](#) is one such network, which your educators can read about. After reading this case study, conduct one of the following activities:

- Let educators imagine that they want to create a similar network of like-minded marine educators to foster ocean literacy in their city or region. Ask them how they would benefit from such a network (e.g., access grants information, exchange lesson plans, or develop joint conservation actions), and what steps they would take to join or create such a network.
- If your educators don't have access to a local ocean educator network, encourage them to reach out to a marine educators' network elsewhere. Educators can adapt their resources, participate in their professional development events, or research their approaches and challenges through an informational interview. One place to find local marine educators networks is the [NMEA Regional Chapter map](#), as well as Ocean Literacy Organizations Around the World (see page 5).



6. Integrating education, conservation, and policy-making. Combining educational programs with conservation and policy-making is crucial for protecting the ocean. Nonformal and school-based environmental education can engage students in programs that integrate all of these, such as through public awareness campaigns, writing letters to policy-makers, and environmental stewardship activities that benefit marine ecosystems. Invite your learners to do the following to explore such a program:

- Invite educators to watch the [EARTHCARE video](#), especially about mangrove restoration (2:03), cruise ships and the Eco-Kids program (22:22), and youth and plastic-related policy (28:04).
- Ask educators to discuss in pairs or small groups how their programs can combine educational activities, community engagement, ecosystem restoration, and policy-making that can benefit marine ecosystems.



<https://youtu.be/awFe8PH4Gzl>



7. Take action. Create a list of potential actions for ocean conservation or ocean literacy that educators could implement with students in the next few months. Help your educators choose and commit to implementing one or more actions. Example actions:

- Promote ocean literacy in your community (e.g., take learners to an aquarium, science center with a marine/aquatic theme, or another ocean-related outdoor experience).
- Reduce the impact of your school or organization on the ocean (e.g., avoid bottled water and single use plastics).
- Advocate for policy changes that benefit the ocean (e.g., writing letters to your elected officials).
- Participate in stewardship activities (e.g., cleaning up a river, seaside, or beach).
- Raise funds for an ocean conservation organization or an ocean literacy education program.

The book [50 Ways to Save the Ocean](#) is a useful resource for this exercise.



The Global Evolution of Ocean Literacy

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Introduction

The Ocean is the defining feature of our blue planet. Five great, interconnected ocean basins, the Atlantic, Pacific, Indian, Arctic, and Southern . . . contain 97 percent of Earth's water. The vapor released into the atmosphere returns as rain, sleet, and snow, ever replenishing the planet with freshwater. All life, including our own, exists because of the ocean. Our lives depend, now and forever, on the health of the ocean. Understanding the ocean is essential to comprehending and protecting this planet on which we live.¹

This excerpt, taken from [Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages](#), introduces the central tenet and stance of the ocean literacy movement.

For climate scientists, the importance of the ocean is clear: the ocean covers 70 percent of Earth's surface, regulating our climate and weather patterns by transferring heat from the equator to the poles.² It's home to a vast diversity of species—at least 250,000 species have been found, with an estimated 750,000 species not yet investigated—and is a place of shimmering, ethereal beauty.³ Further, the ocean makes up 97 percent of the Earth's total water.⁴ And yet, this incredible resource faces countless threats caused by human behavior. From ocean acidification to biodiversity loss to plastic pollution and marine debris, the ocean has become a literal dumping ground.

¹ National Oceanic and Atmospheric Administration (NOAA), Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages (Washington, DC: NOAA, 2021), 3, https://static1.squarespace.com/static/5b4cecfde2ccd188cfed8026/t/60b90193ec346816a95717bb/1622737304272/OceanLiteracy_ENG_V3.1_2021.pdf

² Barry W. Eakins and G.F. Sharman, *Volumes of the World's Oceans from ETOPO1* (Boulder, CO: NOAA National Geophysical Data Center, 2010), https://www.ngdc.noaa.gov/mgg/global/etopo1_ocean_volumes.html

³ Meryl Williams, Heather Mannix, Kristen Yarincik, Patricia Miloslavich, and Darlene Trew Crist, "Scientific Results to Support the Sustainable Use and Conservation of Marine Life: A Summary of the Census of Marine Life for Decision Makers," *Census of Marine Life* (2011): 3, http://www.coml.org/comfiles/policy/ENGLISH_Policy_Report_reduced.pdf

⁴ Water Science School, "How Much Water Is There on Earth?" United States Geological Survey (USGS), November 13, 2019, <https://www.usgs.gov/special-topics/water-science-school/science/how-much-water-there-earth>



The issues surrounding the ocean are diverse and multidisciplinary. They are environmental, economic, social, and cultural in nature. These issues include, but are not limited to:

- Overfishing and loss of livelihoods
- Loss of historic knowledge regarding fishing and cultural practices
- Sea level rise
- Marine biodiversity loss
- Marine litter and plastic pollution
- Ocean acidification
- Ocean deoxygenation
- Coral bleaching
- Eutrophication

As with nearly every environmental issue, humans are the cause and the solution. But creating stewards of our ocean is uniquely challenging. Many people have never been to the ocean or rarely experience it, and thus lack the attachment that those in coastal communities may have. Even those in coastal communities may have limited ocean access for many reasons, such as time, resources, and transportation barriers and physical inaccessibility (e.g. accessible pathways and infrastructure). Coupled with this, many of the problems are happening under the surface—completely out of sight to the casual observer.

Our very survival depends on the health of the ocean. As educators, our challenge is to provide tools, resources, and multiple opportunities for people of all ages and socio-demographics to learn about the ocean and how we are inextricably interconnected with it. Education plays a critical role in empowering people not only with knowledge about the ocean and marine science but also with the agency to take action, whether at small or large scale.

This chapter explores ocean literacy and analyzes challenges and opportunities for engaging global citizens in an expanding ocean literacy campaign.

Defining Ocean Literacy

Ocean literacy is an understanding of the ocean's influence on you—and your influence on the ocean. An ocean-literate person:

- understands the [Essential Principles and Fundamental Concepts](#) about the ocean, as described in the *Ocean Literacy Guide*;
- can communicate about the ocean in a meaningful way; and
- is able to make informed and responsible decisions regarding the ocean and its resources.



The global ocean literacy campaign was initiated by grassroots efforts to incorporate ocean literacy concepts into the U.S. education system.⁵ A series of consensus-building meetings during 2004–2005 brought together scientists, educators, and policy makers and resulted in the definition of ocean literacy and the seminal document *Ocean Literacy: The Essential Principles of Ocean Sciences K–12*, which became the centerpiece of a four-part U.S. Ocean Literacy Framework:

- [*Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages* \(Ocean Literacy Guide\)](#)
- [*The Ocean Literacy Scope and Sequence for Grades K–12*](#)
- [*Alignment of Ocean Literacy to the Next Generation Science Standards \(NGSS\)*](#)
- [*The International Ocean Literacy Survey \(IOLS\)*](#)

This framework is the foundation of what has become an international effort to increase ocean literacy for all, no matter where they live.

A Brief History of the *Ocean Literacy Guide*

Before the ocean literacy definition, principles, and concepts were developed, U.S. science education standards and assessments were devoid of almost any ocean science concepts and, as a result, few K–12 students received instruction on these topics. As early as 2000, the National Oceanic and Atmospheric Association (NOAA), the National Science Foundation-funded (NSF) Centers for Ocean Science Education Excellence (COSEE), the National Geographic Society, the National Marine Educators Association (NMEA), the College of Exploration, and the Lawrence Hall of Science, University of California Berkeley convened a series of meetings to reach consensus on the most important ideas people should understand about the ocean.⁶ These meetings resulted in the publication of *Ocean Literacy: The Essential Principles of Ocean Sciences K–12*, originally published in 2005, updated in 2013, and renamed *Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages*. This publication, referred to as the Guide, is continually updated and has been [translated](#) into several languages.

This work had a significant impact on U.S. science education, ensuring that ocean concepts are well-represented in *A Framework for K–12 Science Education* (National Research Council [NRC], 2012) and the *Next Generation Science Standards* (NGSS Lead States, 2013). See Appendix for more information.



^{5,6}Diana L. Payne, Meghan E. Marrero, Sarah E. Schoedinger, and Catherine Halverson, “The Rise and Fall of the Tide: Ocean Literacy in the United States,” *Mediterranean Marine Science* 23, no. 2 (2022): 270–276, <https://doi.org/10.12681/mms.27410>



Impacts and Outcomes

One of the key ways to address complex environmental and societal issues, such as climate change, is by improving public understanding of the importance of the ocean and inspiring positive action. As argued by Sterling, “The difference between a sustainable or a chaotic future is learning.”⁷ While the original purpose of the *Ocean Literacy Guide* was to address the lack of ocean-related content in national science education standards in the United States, instructional materials, and assessments, educators and others have found the Ocean Literacy Framework to be useful to anyone, anywhere who seeks to increase ocean literacy, and provides evidence, knowledge, and essential tools to:

- support learners’ understanding of the ocean while increasing the reach and prominence of ocean literacy;
- incorporate ocean literacy into K–12 and post-secondary science curricula in a meaningful way to help learners become more science literate; and
- emphasize that teaching ocean concepts is essential to achieving the vision of a science-literate society, and that you can’t be science-literate unless you are also ocean-literate.

Informed by research on teaching and learning science, the Ocean Literacy Framework tools are practical, research-based resources to influence marine education instruction throughout K–12 schools, college courses, museums, aquariums, science centers, parks, and other informal learning spaces. Notably, the *Ocean Literacy Guide* inspired and served as a model for other literacy guides (e.g., climate, energy, estuaries, Great Lakes, Bay of Bengal, Mediterranean Sea) and has been [translated](#) into multiple languages and adapted for other cultures.

Most notably, the *Ocean Literacy Guide* and the *Essential Principles of Ocean Science* are the foundation for UNESCO’s [Ocean Literacy for All: A Toolkit](#), which connects the seven Ocean Literacy Principles to the United Nations’ (UN) Sustainable Development Goals (SDGs) and the [IOC-UNESCO Decade of Ocean Science for Sustainable Development](#) (a global movement to find innovative ocean solutions from 2020–2030). The *Ocean Literacy for All: A Toolkit* identifies not only cognitive learning outcomes but also socio-emotional and behavioral learning outcomes, such as being able to empathize with people whose livelihoods are affected by changing fishing practices and campaign for expanding no-fish zones and marine reserves.

⁷ Stephen Sterling, *Sustainable Education: Re-Visioning Learning and Change* (Darlington: Green Books, 2001), 10.

Global Ocean Literacy

Ocean Literacy Organizations Around the World

In the same way that the Ocean Literacy Framework has provided a foundation for advancing global ocean literacy, the [National Marine Educators Association \(NMEA\)](#), a marine education association in the United States that formed in 1976, has inspired and cultivated several other significant efforts around the world (see the ocean literacy timeline 2002–2018). The [International Pacific Marine Educators Network](#) (2007), the [European Marine Science Educators Association](#) (2012), the [Canadian Network for Ocean Education](#) (2013), the Korea Marine Educators Association, and the [Asia Marine Educators Association](#) (2016), [Bay of Bengal Ocean Literacy Network](#) (2018), and [Red de Educación Latinoamericana para el Océano \(RELATO\)](#) (2019) have all formed expressly to promote marine education and advance ocean literacy. The [RELATO case study](#) explores the development of a marine educator’s network in Latin America and the Caribbean.

Global Ocean Initiatives

Since 2012, the European Commission has invested funds in large international initiatives to cultivate ocean literacy across Europe. In 2013, a [Vision Statement on Ocean Literacy, and Atlantic Ocean Cooperation Between the European Union, United States of America, and Canada](#) was established to build upon the [Galway Statement on Atlantic Ocean Cooperation](#) in ocean research, defining ocean literacy objectives in the context of that cooperation. This has since expanded to the southern Atlantic via the [Belém Statement on Atlantic Research and Innovation Cooperation](#) and is evolving into an [All-Atlantic Ocean Research Alliance](#). UNESCO launched an [Ocean Literacy for All: A Toolkit](#) in 2018, which connects the seven Ocean Literacy Principles to the [United Nations’ Sustainable Development Goals \(SDGs\)](#). Ocean literacy is also a focus of the planned outcomes of the [UN Decade of Ocean Science for Sustainable Development \(UN Ocean Decade\)](#), a global effort to engage citizens in “transformative ocean science solutions for sustainable development.” Finally, one of the UN Decade-endorsed programmes, [Ocean Literacy With All \(OLWA\)](#), builds capacity for global ocean literacy through international partnerships and projects.



Ocean literacy must embrace interdisciplinary thinking and include multiple perspectives to help people have a deeper understanding of the interconnectedness of environmental, social, and economic issues, enabling better informed decision making and actions. This could mean taking an interdisciplinary approach and including a broader range of disciplines in marine education strategies and programming. For example, in its 2020 draft Ocean Literacy Strategy, the IOC-UNESCO Decade for Ocean Science recognizes that “ocean literacy must be integrated in a broader context with practices in more educational frameworks.”⁸ IOC-UNESCO advises connecting ocean literacy to sustainable development concepts, such as climate change, biodiversity, disaster risk reduction, and sustainable lifestyles. Even more broadly, connecting ocean literacy to social sciences, current events, and policies, and making it relatable across cultural, social, and political spectrums will engage even more audiences and stakeholders.

⁸ IOC-UNESCO, “United Nations Decade of Ocean Science for Sustainable Development,” 2021, <https://www.oceandecade.org/>

Ocean Literacy in Action: A Case Study

While resources like the *Ocean Literacy Guide* and the *UN Ocean Literacy for All: A Toolkit* have made waves for global marine education in the last few decades, an inherent challenge to developing ocean literacy that marine educators should keep in mind when designing programming and curricula is access to the ocean. Additionally, marine educators must teach ocean-related concepts in culturally relevant ways that speak to the diversity of perspectives and knowledge frameworks that exist. “[The Sir Peter Blake Trust \(BLAKE\) New Zealand \(NZ\) Virtual Reality \(VR\)](#)” case study presents just one way to overcome the physical barriers to ocean access, while simultaneously connecting students with marine habitats and issues relevant to their own country and culture(s).

Many people don’t have the time, resources, or physical access to the ocean.⁹ This presents a barrier to both emotionally and physically engaging citizens in ocean literacy. For example, those who have never seen the ocean may find it difficult to be emotionally invested in ocean-related issues or calls to action—or they may not even be aware that such ocean-related issues exist. In places where the ocean is physically accessible, “most of the marine environment remains hidden under the surface and far away from the coasts, leading to a situation where only a small fraction of the marine diversity and processes can be encountered and directly experienced.”¹⁰

Despite New Zealand being an island nation, many people still face barriers in accessing the ocean. To overcome these barriers, educators from [BLAKE](#) use virtual reality headsets and 360-degree underwater videos to teach students about the Ocean Literacy Principles through an immersive underwater experience for primary and secondary school students.

Virtual reality uses multisensory technology, such as a head-mounted display and audio system, to provide an engaging, first-person experience of an augmented or virtual environment. Through vivid imagery, VR places users into another perspective—for example, a user might take on the first-person perspective of a diver exploring sea anemones near the ocean floor. This first-person point of view plays a significant role in influencing social behavior, encouraging affective responses to situations that users might not have otherwise experienced. Recent studies show encouraging learning outcomes from using VR as a tool for environmental literacy, including ocean literacy, as it can promote pro-environmental behaviors.¹¹



Photo: BLAKE



Photo: New Zealand Geographic

⁹ Géraldine Fauville, Patricia McHugh, Christine Domegan, Åsa Mäkitalo, Lene Friis Møller, Martha Papathanassiou, Carla Alvarez Chicote, Susana Lincoln, Vanessa Batista, and Evy Copejans, et al., “Using Collective Intelligence to Identify Barriers to Teaching 12–19 Year Olds About the Ocean in Europe,” *Marine Policy* 91, (2018): 85–96, <https://doi.org/10.1016/j.marpol.2018.01.034>

¹⁰ Francesca Santoro, Selvaggia Santin, Gail Scowcroft, Géraldine Fauville, and Peter Tuddenham, eds. *Ocean Literacy for All: A Toolkit*, IOC–UNESCO & UNESCO Venice Office, Paris: IOC Manuals and Guides, no. 80, (2018): 68, <https://unesdoc.unesco.org/ark:/48223/pf0000260721>

¹¹ Géraldine Fauville, Anna Carolina Muller Queiroz, and Jeremy N. Bailenson, “Virtual Reality as a Promising Tool to Promote Climate Change Awareness,” in *Technology and Health: Promoting Attitude and Behavior Change*, eds. Jihyun Kim and Hayeon Song (Elsevier, 2020): 91–108, <https://doi.org/10.1016/B978-0-12-816958-0-2.00005-8>

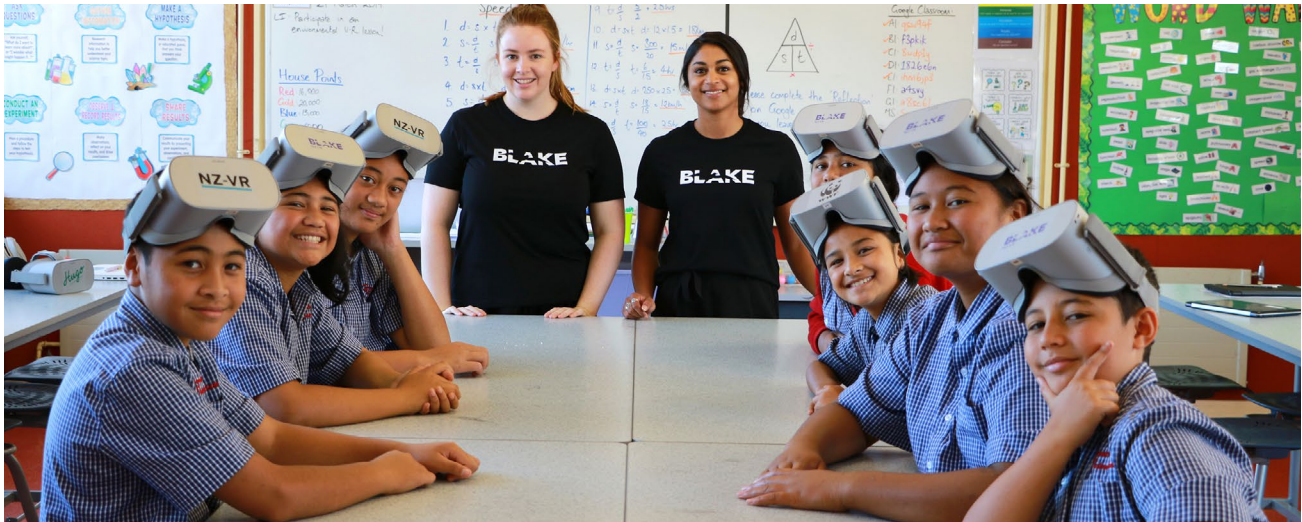


Photo: BLAKE

BLAKE's NZ-VR marine education program focuses on marine life in and around the islands of New Zealand, allowing students to see under the waves of the South Pacific Ocean and the Tasman Sea. Through vivid sensory experience of marine habitats, BLAKE's NZ-VR program provides a psychological experience in which the students feel as if they are underwater.

Beyond providing a solution to physical ocean access, BLAKE NZ-VR also situates its curricula through an Indigenous Traditional Knowledge lens, which recognizes Indigenous knowledge and voices and provides an important way to culturally connect to marine education.¹² In 2021, the BLAKE team released a version of their VR marine education curriculum in *te reo*, the language of New Zealand's Indigenous Māori population, and through a Māori worldview, which emphasizes the interconnectedness between living and non-living things. Through this worldview, students understand their role and connectedness to critical issues faced by the marine environment due to human interactions.¹³ BLAKE reported that expanding their curriculum to include the Māori worldview has been highly impactful for Māori and Pasifika^{14*} students, and importantly, provided a deep cultural connection for those students that either grew up in, or moved to, more inland and urbanized areas, away from their cultural coastal roots.

After evaluating the program, BLAKE NZ-VR has found that using VR in marine education is highly engaging for students. The program allows students—a majority of whom live in urban areas—to be immersed and connected to the coast and waters of their island, providing them the opportunity to experience firsthand New Zealand's marine life, as well as environmental issues related to the ocean. After one year of the program, BLAKE found that student interest in protecting the ocean increased from 39% to 70%, and that 95% of the teachers found the program to be an effective form of environmental education. Finally, BLAKE NZ-VR was most encouraged by the impact their program had for Māori and Pasifika students, as it provided a re-entry point for those students that, prior to the program, had experienced a reduced or lost cultural connection to the ocean. This case study demonstrates just one creative and effective way to address the problem of ocean access for meaningful, culturally-relevant ocean literacy programming.

¹² Craig Strang, "Education for Ocean Literacy and Sustainability: Listening to Elders, Listening to Youth," *Journal of Marine Education* 24, no. 3 (2008): 7–10, http://marestage.lawrencehallofscience.org/sites/mare.lawrencehallofscience.org/files/images/mare_education_for_ocean_literacy_and_sustainability.pdf

¹³ New Zealand Environment Guide, "Māori and Biodiversity," Environment Foundation, revised April 11, 2018, <https://www.environmentguide.org.nz/issues/biodiversity/maori-and-biodiversity/>

¹⁴ * Pasifika (sometimes spelt Pasefika) is used to refer to the people, cultures, and language of Pacific groups (including: Sāmoa, Tonga, the Cook Islands, Niue, Tokelau, Tuvalu, and other smaller Pacific nations) who are now living in New Zealand. (Taken from [New Zealand's Ministry of Education](http://www.moe.govt.nz/our-services/our-services-for-young-people/pasifika)).



Conclusion

The ocean literacy movement helps improve people’s understanding of the value and challenges of our ocean. It provides skills to communicate about the world’s marine ecosystems in a meaningful way and make informed and responsible decisions regarding the ocean and its resources. Most importantly, it is changing the way we think and act. Understanding the importance of the ocean, climate, and Earth systems is no longer on the margins of science education—it is essential. And it is essential that ocean literacy programming simultaneously builds the skills, attitudes, and motivations that people need to make informed decisions and take responsible actions to address the challenges facing our ocean and coastal communities.

UNESCO’s [Ocean Literacy for All: A Toolkit](#) includes more about how to link ocean literacy to the UN Sustainable Development Goal #14 and highlights a number of cases that demonstrate how education can help advance our work to protect the ocean. In addition, the [BLAKE NZ-VR case study](#) provides an example of addressing some of the challenges often faced by educators teaching ocean literacy concepts. In the next section, we provide discussion questions and activities to help further explore the case study and to reflect on how we can better integrate ocean literacy in our teaching and learning.



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Appendix

About The Ocean Literacy Framework

The [*Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages*](#) (*Ocean Literacy Guide*) describes the essential concepts an ocean literate person should know. This *Ocean Literacy Guide* brought about changes in funding guidelines in several federal agencies (e.g., NOAA and the National Science Foundation) resulting in numerous educational projects that integrate and promote ocean science concepts. The ocean literacy tools provided a framework for designing exhibits and educational programs in many informal learning settings, and have fundamentally shaped what people are seeing and hearing when they visit them (e.g., the Smithsonian’s Sant Ocean Hall, the Korea Institute of Ocean Science and Technology, and NOAA National Marine Sanctuaries).

[*The Ocean Literacy Scope and Sequence for Grades K–12*](#) provides a road map for educators to help their learners increase their ocean literacy. Developed with significant participation by hundreds of scientists and science educators, this tool provides specific guidance through [a series of 28 conceptual flow diagrams that organize the ideas of the seven Ocean Literacy Essential Principles into grade bands](#). This effectively shows what students should know at the end of key grade levels. It represents a community consensus regarding essential ideas in ocean science for all learners and provides specific guidance to help educators as they work to grow their learners’ conceptual understanding of essential ocean concepts.

The [*Alignment of Ocean Literacy to the Next Generation Science Standards \(NGSS\)*](#) aligns ocean literacy to U.S. K–12 science standards (adopted or adapted by a majority of states) that set the expectations for what students should know and be able to do, in an effort to improve science education for all students. The Alignment details why teaching ocean concepts is integral and essential to achieving the vision of the NGSS. Intended for teachers, school leaders, informal educators, and curriculum developers, it provides critical guidance about when and how ocean concepts can be strategically inserted into science curricula in schools and can be used to influence state, district, and school science implementation plans. This Alignment focuses attention on places in the NGSS where ocean literacy is essential to understanding the scientific concepts in the NGSS, but the connection may not be obvious. It also provides strong justification for educators to provide marine education learning experiences that supplement traditional texts that typically don’t adequately address ocean concepts.

As ocean literacy activity gained momentum, the need for a common, shared measurement tool was widely expressed by members of the ocean literacy community around the world. In 2015, [*The International Ocean Literacy Survey \(IOLS\)*](#) was developed to determine the impact of particular interventions, to establish a baseline of ocean literacy in particular communities, to detect changes in ocean literacy levels in communities over time, and to compare differences in levels of ocean literacy across communities. The IOLS has been established as a community-based measurement scale, including questions on the content of the Essential Principles and Fundamental Concepts.¹⁵

¹⁵ Géraldine Fauville et al., “Using Collective Intelligence to Identify Barriers to Teaching 12–19 Year Olds About the Ocean in Europe.”; Ying-Fang Chen, Matthew A. Cannady, Géraldine Fauville, and Craig Strang, “Working Toward an International Assessment of Ocean Literacy: Validating Instrument with Rasch Measurement Model,” (American Educational Research Association (AERA) annual meeting, San Francisco, CA, 2020), https://static1.squarespace.com/static/5970e07ad2b857f9aa5f153f/t/5dbb5b027bb30152d476edce/1572559620727/IOLS+EN_AERA2020.pdf