Ocean Literacy Toolkit

Connecting to the oceans:
Supporting ocean literacy and
public engagement

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Version 1.0

This toolkit was created as part of the Future Seas initiative.
www.futureseas2030.org

Future Seas

Future Seas is a unique interdisciplinary research collaboration focused on addressing real-world challenges to provide a clear foundation for future research activities that can facilitate desirable transformative change, i.e. in the context of the UN Decade of Ocean Science for Sustainable Development 2021-2030. The initiative is spearheaded by the Centre for Marine Socioecology in Tasmania, Australia, and brings together over 100 researchers from the University of Tasmania (UTAS), the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and other institutions. Within UTAS, members come from the Colleges of Arts, Law and Education, Health and Medicine, and Sciences & Engineering (specifically the Institute for Marine and Antarctic Studies and the School of Technology, Environments and Design). The collaboration includes psychologists, public health and education experts, philosophers, ecologists, oceanographers, climate modellers, economists, social scientists, engineers, information and communications technology researchers, as well as governance, law and policy experts.

Future Seas takes a fresh, people-centred approach to thinking about key ingrained sustainability challenges over the coming decades. Using a strategic technique called 'foresighting', the collaboration has developed interdisciplinary, evidence-informed plausible scenarios of the future 2030, for each of several key challenges, including the focus of this toolkit.

Challenge 4 - Connected to the oceans: supporting ocean literacy and public engagement

This challenge collaboration synthesises knowledge and perspectives from a range of disciplines to identify and outline the potential for positive change in global ocean literacy and connectedness to the ocean. In doing so, we highlight four key drivers through which to achieve our aims:
1. Education,
2. Cultural connections,
3. Technological developments, and
4. Knowledge exchange and science-policy interconnections

Our collaboration explores these drivers in-depth, to identify how each may play a role in improving understanding and perceptions of ocean sustainability and engender widespread societal support for effective ocean management and conservation at local, regional and global scales. In doing so, we develop this **toolkit for ocean literacy**, a practical broad-focus resource for enhancing ocean connections worldwide. The toolkit is founded upon the four drivers and aims to equip the user with approaches to overcome limitations to developing ocean literacy.

In this document, we consolidate a three-phase approach to progressing ocean literacy that can facilitate behavioural change as a pathway to achieving a sustainable future. This phased approach is central to building a sound understanding of the diverse approaches available for increasing ocean literacy, as well as ensuring that the toolkit can be useful and accessible to a range of end-users (i.e. communities, educators, managers, and policy-makers). The applicability of the ocean literacy toolkit is illustrated by our provision of examples of diverse existing ocean literacy initiatives (see C). This toolkit aims to guide the engagement of diverse communities with (and in learning about) ocean issues.

Ten best practice principles for ocean learning communication

Evidence-based principles for communicating about ocean issues and engaging people with the ocean.

1. Understand what people already know

It is crucial to understand current knowledge levels before presenting to groups, working with communities or engaging with policy-makers. Identify who your target audience are[1] and what they know and/or want to know. This can be assessed, for example, by conducting target-group surveys[2,3], identifying peoples' values and perceptions[4,5], or directly asking target groups, '*What knowledge is needed to inform policy right now?*' or '*What do you want to know?*' (e.g. as successfully demonstrated by the Curious Climate Tasmania science communication programme).

2. Build on existing knowledge

Understanding what groups already know provides clarity for building upon their knowledge base. This foundation can guide a 'best fit' for developing a communication and education strategy[6]. Engaging with people on their current understanding about an issue (e.g. plastic pollution) and inviting them to reflect on this understanding (e.g. '*What are the sources of this plastic?*'; '*What can I do to minimise my contribution to plastic pollution?*', etc.) can kick-start the constructive, analytical thinking key to learning and developing literacy[7,8].

3. Be relatable

Communicating information in formats that connect to individuals' lives and experiences can allow them to better understand marine issues and impacts. Personal relevance is key to driving changes in individualist societies[6,9]. For example, Schuldt et al. (2016) demonstrated that framing communication (i.e. on ocean health) around personal experiences, rather than on 'distant' environments or issues, allowed people to better understand the impact of emerging issues. Relatability also includes the language used; using understandable, accessible language is key to conveying messages for impact[11].

4. Appeal to emotions

Individuals need to feel an affinity towards the ocean if they are to engage in the pro-environmental behaviours central to ocean literacy[12]. 'Sense of place' is the emotional bond that people have (or can develop) towards a specific place[13], and an individuals' attachment to a place (e.g. to a favourite beach) increases their likelihood to engage in environmentally-friendly behaviour related to that place (e.g. coastal and ocean environments more generally)[14]. Communicating through emotional means (e.g. vivid images, personal places, etc.) can allow people to connect and engage with environmental information more readily[11]. Note that care should be taken to ensure this appeal to emotions employs positive messaging, to reduce the chance of isolating or polarising groups within a community.

5. Be positive

Relaying and describing positive ocean success stories can create feelings of optimism that inspire action and future positive outcomes[1]. However, balancing the communication of information (e.g. relating to ocean success stories) between optimism and reality is important for building community resilience and hope as the oceans (and global climate) face unknown and unprecedented changes[15]. These positive strategies (and resulting emotions) are demonstrated to increase engagement with, and sustainment in, behavioural change strategies[16].

6.   Adopt action-orientated approaches

Creating and demonstrating knowledge in action can empower people by demonstrating what they can do and achieve[11]. 'Learning by doing' approaches to communicating ocean issues include ocean games[17], citizen science[18] and systems dynamics learning approaches[3]. These experiential approaches to ocean learning can build the skills necessary to inform pro-environmental behaviour[8], and improve understanding on how individual behaviours can (positively or negatively) impact the ocean[19].

7.   Frame around social norms

Social norms are peoples' beliefs or perceptions about common or accepted behaviours within a group[20]. Messages that are based around reinforcing and upholding norms frequently result in positive change and impact by highlighting appropriate behaviours and attitudes that reflect collective or group behaviours[21]. Communicating norms around ocean-friendly behaviours is a promising approach to improving ocean literacy[19]. For example, framing fishing regulations around social norms has demonstrated the potential to increase pro-environmental fishing behaviours[22]. Note, however, that it is important to highlight positive (and not negative) group behaviours whilst leveraging social norms[11].

8.   Collaborate

Positive collaboration can create unity and collective capacity to deal with ocean issues[1]. In particular, participatory approaches to designing ocean literacy activities (e.g. between scientists, communities, teachers and students) can improve and expand learning outcomes and impacts[23] by including a diversity of knowledge types[24] and, in turn, producing outcomes that are likely to fit with the desires and worldviews of different demographics[25,26]. These benefits are achieved via the cumulative effects of internalised values which are engendered through collaboration, and the associated commitment to achieve desired outcomes which allow for self-actualisation. Working in collaboration with others can also reinforce a more environmentally-connected sense of self-identity as well as pro-environmental social norms; key factors in predicting pro-environmental thoughts and behaviours[27-29].

9.   Update

Science is a complex and constantly evolving process that continues to challenge prior understandings[24]. This continuing development of new knowledge should be considered when developing ocean literacy interventions and activities, with the potential to actively involve communities and stakeholders in the discovery and development of new understandings[30]. For example, whilst communities can learn and engage with the ocean through participation in citizen science[31], they can also contribute to the production of new knowledge and marine science[32-34]. Ocean learning initiatives should work to incorporate new activities and materials based on learner interests, current issues, and emerging discoveries[35].

10. Celebrate

Improved ocean literacy will occur across diverse scales and in many forms, all of which should be celebrated. Championing successful initiatives and developments allows others to learn, and can inspire innovative approaches to improve ocean literacy[36]. In addition to communicating positive stories and messages (i.e. Best Practice Principle #5), global achievements including establishing ocean literacy networks, defining shared ocean science goals (i.e. the UN Decade of Ocean Science for Sustainable Development), committing to conservation targets (e.g. marine protection) and global ocean events (i.e. World Ocean Day) should be celebrated as progression in this movement to achieving ocean literacy. Developing strong, consistent and inclusive ways to communicate and share achievements (and resources) will enhance mutually beneficial partnerships towards achieving ocean literacy[19,36-39].

Photo credit: Scott Ling

Ocean literacy activity / intervention design framework

We draw on several established frameworks (e.g. Bloom's Taxonomy, the Seven Principles of Ocean Literacy) to create a guide for ocean literacy-focused activities and interventions[40-43].

Phase 1

i) Identify the target group and their current level of ocean literacy

If we seek to achieve improved ocean literacy outcomes, we must first understand the target audience; i.e. *Who is (are) they? What are their demographics (age, gender)? What is their current behaviour, and why are they exhibiting this behaviour? What are their experiences and perspectives of the ocean?* Addressing questions, we gain insight into those we are aiming to engage with, as well as an awareness of their existing needs and experiences that may help or hinder both developing and improving ocean literacy.
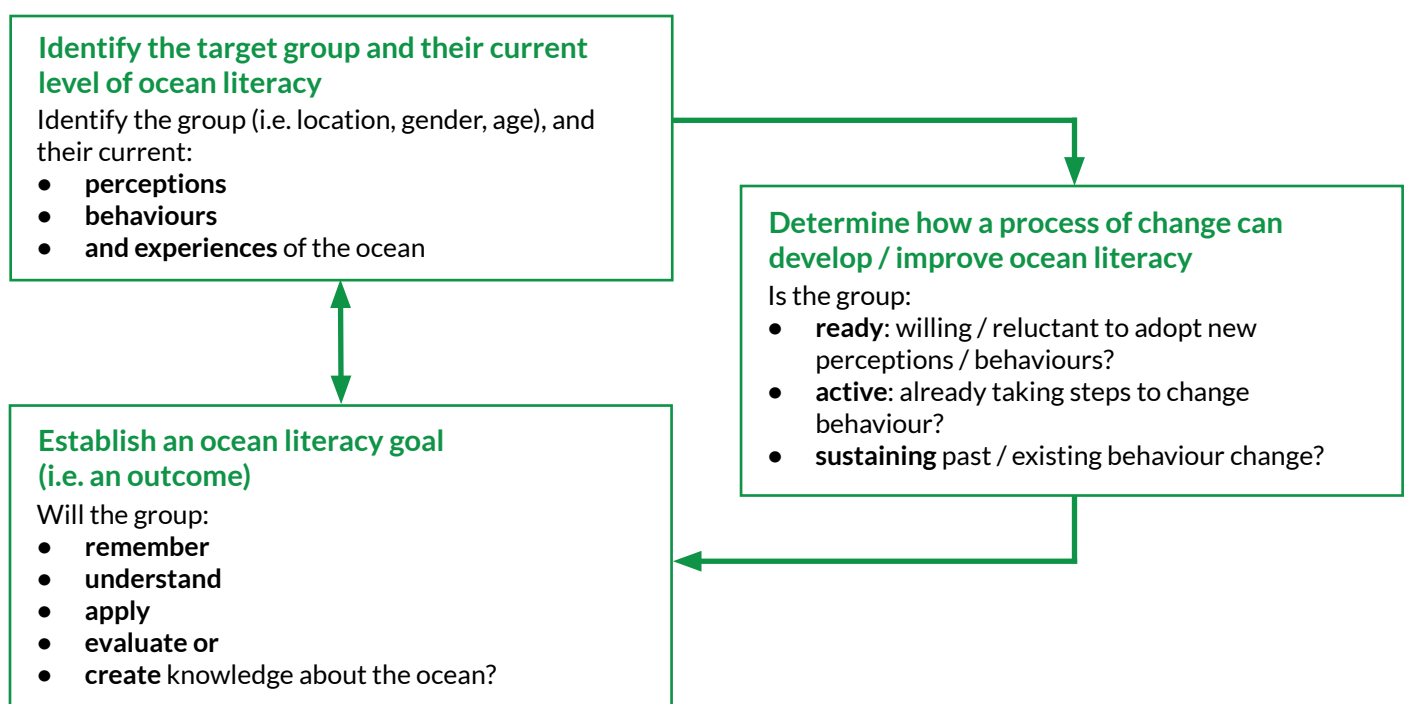
ii) Establish an ocean literacy goal (i.e. an outcome)

Given that the 'achievement' of ocean literacy cannot be assessed as the attainment of a defined end-point but rather a continual progression towards improvement in literacy, we suggest that the goal in engendering change be defined as 'improved literacy state' following the delivery of a change intervention. A model of improved state can be drawn from Bloom's Revised Taxonomy[44] which was developed to categorise and order thinking skills and objectives.

iii) Determine how a process of change can develop / improve ocean literacy

Behavioural change is a complex multifaceted process that centres on the individual, whilst simultaneously being influenced by a range of internal (i.e. person-level) and external (e.g. societal, organisational, and governmental) factors. We draw from the transtheoretical model of behaviour change[45,46] to understand how to most effectively target energies towards behavioural change strategies. Understanding the mechanisms that underpin behavioural change can allow for the development of strategies that are feasible and effective in achieving change (that spans individual differences in behavioural change readiness) and progress in ocean literacy.

Phase 1: Understand the target group

Identify the target group and their current level of ocean literacy
Identify the group (i.e. location, gender, age), and their current:
- **perceptions**
- **behaviours**
- **and experiences** of the ocean

Establish an ocean literacy goal (i.e. an outcome)
Will the group:
- **remember**
- **understand**
- **apply**
- **evaluate or**
- **create** knowledge about the ocean?

Determine how a process of change can develop / improve ocean literacy
Is the group:
- **ready**: willing / reluctant to adopt new perceptions / behaviours?
- **active**: already taking steps to change behaviour?
- **sustaining** past / existing behaviour change?

Phase 2

i) Identify the type of activity / intervention

Identifying the range of potential interventions that can bring about improved ocean literacy allows for comparison across diverse approaches.

ii) Assess the feasibility of the proposed activity / intervention

Before implementation, the feasibility of the proposed intervention should be fully assessed using the APEASE Framework – i.e. whether the intervention is **A**ffordable, **P**ractical, **E**ffective, **A**cceptable, **S**afe and **E**quitable[47] for the target group and ocean literacy goal. Ocean literacy interventions should be assessed against these criteria **prior to implementation**, as an inability to meet any of these factors will undermine successful implementation and maintenance of anticipated behaviour change (i.e. improved ocean literacy).

Phase 2: Assess the proposed activity / intervention design (i.e. prior to implementation)

Identify the type of activity / intervention	**Assess the feasibility of the proposed activity / intervention**
e.g. school curricula, citizen science programme, community project, snorkeling experience, online game, visual / performance art, etc.	Is the activity / intervention: • **affordable** • **practical** • **effective** • **acceptable** • **safe** • **equitable?**

Examples of existing ocean literacy activities and interventions

Specifically aligned to four drivers, i.e.

i.   Education

ii.   Cultural connections

iii. Technological developments drivers

iv.   Knowledge exchange and science-policy interconnections

1   The EU Horizon 2020 funded **Sea Changes #LoveTheOcean** hosted on Valentine's Day 2018 aimed to engage people through their love of ocean spaces by committing to take real action every day. The campaign reached out to communities and asked them to post photos or short videos indicating the changes they planned to make in their daily lives, and coincided with the final conference event of the Sea Changes Project in Paris. Participants shared project pledges, actions and the small changes they planned to make online, tagging them with #LovetheOcean.

Tags: Fun, scalable, experiential, social media, technological/digital
Link: https://vimeo.com/showcase/4588555

2   *I Live By The Sea* **International Youth Photo and Film Contest** is a worldwide competition for youths up to the ages of 21. Contestants are invited to use any type of visual art to present a story of their sea with the goal of spreading and sharing knowledge about marine environments and marine conservation issues, and promoting knowledge exchange between marine users across regions.

Tags: Fun, experiential, knowledge transfer, technological/digital, global, youth
Link: http://www.todaywehave.com/CONTEST.html

3   The Institute for Shipboard Education (ISE) is a non-profit based in the USA that administers the **Semester at Sea** study abroad program in conjunction with the Colorado State University. The mission of ISE is to educate individuals with the global understanding necessary to address the challenges of our interdependent world.

Tags: Fun, experiential, youth
Link: https://www.semesteratsea.org/

4   The **Good Fish Sustainable Seafood Guide** is a website and app tool that provides easily available information on sustainable seafood choices in Australia. The initiative is run by the Australian Marine Conservation Society and recognises that the food service industry has a huge influence on current seafood supply chains. The guide aims to teach communities about their seafood options and encourage them to become marine stewards who make informed consumer choices. The guide has also developed partnerships with suppliers and vendors around the country so that consumers can learn and be informed of the sustainability of the fish they choose to eat.

Tags: Online, knowledge transfer, all ages, scalable, technological/digital
Link: https://goodfish.org.au/

5   There are many ocean science outreach and communication channels on social media platforms. The **@oceanseaicenpi channels** on Instagram, Twitter and Facebook are one such example that have been used for the past six years by a team of researchers based in Norway to communicate ocean and sea ice science to the wider public groups[48]. This science outreach through social media covers topics including science concepts, science history, fieldwork, new findings and highlights scientists.

Tags: Low-cost, all ages, educational, social media, technological/digital, fun
Link: https://www.instagram.com/oceanseaicenpi/ https://twitter.com/OceanSeaIceNPI

6   **Sea Walls: Artists for Oceans** is a public art program that brings the oceans into streets around the world to highlight global issues occurring in our oceans. The program uses public art to (re)connect and educate communities, both coastal and landlocked, with the ocean. Since 2014, Sea Walls has been organising festivals around the world (in the USA, Canada, New Zealand, Australia, Mexico).

Tags: Art, local, scalable, cultural, experiential, all ages, knowledge transfer
Link: https://www.pangeaseed.foundation/sea-walls/
https://www.abc.net.au/news/2018-05-05/sea-walls-artists-for-ocean-public-art-festival/9724180

7   Members of the public traveling with **Global Vision International** learn how to survey coral reefs in a number of different locations worldwide. The volunteers attend a short practical course (the PADI Distinctive Specialty 'Coral Reef Research Diver') which helps participants develop skills in reef creature identification and using transect tapes underwater. The course was specifically created to provide participants with a sense of accomplishment with respect to their ability to understand and learn about the ocean.

Tags: Scalable, fun, experiential, certified divers, knowledge transfer
Link: https://underwater.com.au/article/id/6450/

8   **OCEAN Film Festival** is a World Tour that aims to inspire people to explore, respect, enjoy and protect our oceans. Every year, the festival tours in Australia, Belgium, New Zealand, China and the UK to screen over two hours of inspirational, educational and entertaining films related to the ocean from independent film makers around the world.

Tags: Art, local, scalable, cultural, educational, fun, all ages, knowledge transfer, technological/digital
Link: https://oceanfilmfestivalworldtour.com/

9   **ORCA Marine Mammal Surveyors** is a citizen science project based in the UK that engages people 'from all walks of life' in collecting observations of whale and dolphin populations that are used for marine mammal conservation action. The project trains the participants, who then board ferries and cruise ships leaving ports across the UK to conduct scientific surveys to record the species they see. The project serves to i) educate public groups about marine mammal conservation in the UK and also ii) conduct valuable scientific surveys that are used in ocean management.

Tags: Fun, knowledge-transfer, all ages, experiential, educational, local
Link: https://www.orcaweb.org.uk/get-involved/train-to-be-a-marine-mammal-surveyor

10   A **Practical Introduction to Temperate Marine Biology** is a one-week field course for high-school students taught by the Institute for Marine and Antarctic Studies at the University every year. The course aims to engage, challenge, excite and inspire high school students through an experiential and hands-on marine science learning. The students learn about marine biology concepts and research techniques as they explore marine issues including climate change, invasive species and marine pollution.

Tags: Experiential, youths, fun, knowledge transfer, remote locations
Link: https://www.utas.edu.au/courses/cse/units/xas101-a-practical-introduction-to-temperate-marine-biology

Photo credit: Mary-Anne Lea

11   **The Octonauts** is an English-language children's television series, based on books by Vicki Wong and Michael C. Murphy, produced by Silvergate Media in the UK and animated by Brown Bag Films in Ireland. The series follows an underwater exploring crew, made up of accurately stylized marine animals, who embark on undersea adventures. Although the storylines are fictional, the creatures and locations are based on real marine animals in their natural habitats. This television series has had massive success (particularly in the UK and Australia) and been nominated for several awards for its outreach and success as an educational children's television programme.

Tags: Fun, knowledge-transfer, youth, art, educational, technological/digital
Link: https://www.youtube.com/channel/UCXLLQkbYE-G9jYrra7R4Qsw

12   **#PassOnParrotfish** is a community-based conservation campaign working under part of the Caribbean Marine Biodiversity Program. The campaign engages with communities on the need to protect parrotfish in order to help protect coral reefs. Employing social media and other outreach tools, #PassOnParrotfish encourages fishers, merchants and consumers to refrain from catching, selling or eating Parrotfish, by educating communities on the important role parrotfish play in maintaining coral reef health.

Tags: Knowledge-transfer, all ages, educational, scalable, online, technological/digital
Link: https://www.nature.org/en-us/about-us/where-we-work/caribbean/stories-in-caribbean/pass-on-parrotfish/

13   **'Marine Match'** is a playing card game developed by the citizen science programme Redmap, in collaboration with scientists from the Institute for Marine and Antarctic Studies and traditional Indigenous communities in Tasmania. The cards were developed as a fun way to learn about local marine species. Through playing the game, players learn the names of species (in both English and the Tasmanian Indigenous languages), as well as 'fun facts' from descriptions and images of the species on each card.

Tags: Fun, knowledge-transfer, all ages, cultural experiences
Link: https://www.redmap.org.au/news/2020/01/15/time-to-go-fish--redmap-playing-cards/

14   *Sgeulachdan na Mara* ('Sea Stories') is an online cultural map of the sea based around the island of Barra, in the Outer Hebrides of Scotland. This ocean literacy project explores the relationship between people and their rich cultural knowledge of the seas around Barra and emerged through an art-science collaboration exploring the ocean. The online map was launched in 2013 and involved school pupils interviewing local Barra fishermen and the older members of the community.

Tags: Fun, online, art, knowledge transfer, cultural experiences, scalable, technological/digital
Link: http://www.mappingthesea.net/barra/

15 The Monterey Bay Aquarium in California runs a dynamic education and outreach programme that engages visitors of all ages in learning about topics including marine ecology, sustainable seafood, climate change and plastic pollution. The Aquarium runs multiple 'project-based science' activities including the **Ocean Plastic Pollution Summit** which engages school teachers and equips them with the tools and knowledge necessary to teach and engage their students in plastic pollution issues and solutions. The summit has resulted in many diverse school groups working to co-create research projects that explore these key issues whilst also learning and developing their marine stewardship skills and behaviours.

Tags: Fun, scalable, knowledge-transfer, all ages, experiential
Link: https://www.montereybayaquarium.org/for-educators/teacher-professional-development/teacher-programs/ocean-plastic-pollution-summit

16 Tuna Champions programme is a community founded upon a code of practice for responsible recreational Southern Bluefin Tuna fishing in Australia. A collaboration of scientists and recreational fishing groups created the programme to engage and teach recreational fishers that everyone can 'be stewards of Southern Bluefin Tuna' by minimising the impact on the fishing stock. The programme is a guide and community that shares information on how to catch, handle, release, keep, prepare and tag tuna in ways that are sustainable and ethically responsible.

Tags: Experiential, all ages, knowledge-transfer, online, fun, scalable, technological/digital
Link: http://www.tunachampions.com.au/

17 The board game **Ocean Limited** is a table-top, role-playing game for high-school level ages and above. Players act as diverse ocean stakeholders to negotiate and tackle problems related to marine sustainability and climate change. Through game activity, players learn about critical ocean issues and also engage with diverse stakeholder viewpoints and interests, developing understanding and empathy whilst working to collaboratively achieve marine agreements and sustainable solutions for the ocean[17].

Tags: Fun, experiential, all ages, portable, collective learning
Link: https://www.ocean-limited.de/

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