



Canadian Journal *of* Environmental Education



Exploring Relationships
and Empowering Action:
An Ocean Literacy Reader
VOLUME 24 (1) 2021

Canadian Journal *of* Environmental Education

Volume 24 (1), 2021

The *Canadian Journal of Environmental Education* is a refereed journal published on an annual basis. It seeks to further the study and practice of environmental education by providing a thoughtful forum for researchers, scholars, practitioners, and post-secondary students. The publication and distribution of articles and reviews should contribute to Canadian thought and practice in environmental education and/or issues and practices of international importance to this field of study.

The views expressed in this journal are not necessarily those of the journal's editors, editorial board, or supporters. *The Canadian Journal of Environmental Education* publishes material that may represent divergent ideas, judgments, and opinions.

Production is made possible through the generous support of the Canadian Wildlife Federation, Nipissing University, Trent University, and Lakehead University.



Cover Artwork © 2021 Nancy Breton, Karen Tamminga-Paton, Jane Affleck, Becky Okatsiak & Robi Smith

Printed in Canada with 100% post-consumer recycled paper.

Copyright © Canadian Journal of Environmental Education

ISSN 1205-5352

Editors

Pat Maher, Nipissing University, Ontario

Blair Niblett, Trent University, Ontario

Editors Emeritus

Bob Jickling, Lakehead University, Ontario

Copyediting

Julie Sutherland, Moncton, New Brunswick

Layout & Design

Rusty Brown, Niagara Falls, Ontario

Advisory Editors

Sean Blenkinsop, Simon Fraser University, British Columbia

Mary Breunig, California State University - Sacramento, United States

Peter Cole, University of British Columbia, British Columbia

Pamela Courtenay-Hall, University of Prince Edward Island, PEI

Justin Dillon, University of Exeter, United Kingdom

Janet Dymont, Acadia University, Nova Scotia

Leesa Fawcett, York University, Ontario

Jo-Anne Ferreira, Griffith University, Australia

Annette Gough, RMIT University, Australia

David Greenwood, Lakehead University, Ontario

Randy Haluza-Delay, Independent Environmental Education Researcher, Ontario

Paul Hart, University of Regina, Saskatchewan

Lisa Korteweg, Lakehead University, Ontario

John Chi-Kin Lee, Education University of Hong Kong, Hong Kong

Teresa Lloro-Bidart, California State Polytechnic University Pomona, United States

Heila Lotz-Sisitka, Rhodes University, South Africa

Milton McClaren, Simon Fraser University, British Columbia

Marcia McKenzie, University of Saskatchewan, Saskatchewan

Christopher Reddy, Stellenbosch University, South Africa

Alan Reid, Monash University, Australia

Constance Russell, Lakehead University, Ontario

Bonnie Shapiro, University of Calgary, Alberta

Robert Stevenson, James Cook University, Australia

Dilafruz Williams, Portland State University, United States

Contents

Guest Editorial	5
Reading the Ocean: Framing Ocean Literacy in Canada <i>Lisa (Diz) Glithero & David B. Zandvliet</i>	
What is Canadian Ocean Literacy?: A Community Perspective Essay <i>Anne Stewart</i>	11
Understanding Indigenous Land and Sea-based Ways of Knowing	
Offering <i>Siku Allooloo</i>	19
One with the Ocean <i>Becky Okatsiak</i>	21
DamXan gud.ad t'alang hllGang.gulXads <i>Kii'iljuus Barbara Wilson</i>	24
Canoe as a Teacher <i>Larry (Shucks) Nahanee, Chiaxten Wes Nahanee, Lilia Yumagulova, Kathleen Sperry & Jonathon Reynolds</i>	54
Becoming Arctic Ambassadors: Preparing Inuit Youth for Leadership on Expeditions & Beyond <i>Heather E. McGregor</i>	75
Exploring Ocean Pedagogy in Quebec and Atlantic Canada	
Nous sommes d'océan <i>Nancy Breton</i>	93
Éducation à l'environnement et au développement durable du Saint-Laurent : une démarche éducative pour susciter les apprentissages et développer le pouvoir agir de jeunes Québécois du secondaire <i>Émilie Morin, Geneviève Therriault, Barbara Bader & Dany Dumont</i>	95
Can Ocean Literacy Save our Ocean School? <i>Noémie Roy</i>	113
Recognizing the Ocean's Identity <i>Jane Affleck</i>	132

Community-based ocean literacy: Four case studies of ocean optimism from Mi'kma'ki/Atlantic Canada <i>Julia Ostertag, Justine Ammendolia, Alexandra Vance, Kerri McPherson, Kayla M. Hamelin, Maryse Cousineau, Dounia Daoud, Lyne Morissette, Kimberly Orren, Amy Hill, Evelien VanderKloet, Fred Whoriskey, Sara Iverson, Maggie Sutherland, Shelley Denny, Joseph Beland, Alanna Syliboy, Michael J. W. Stokesbury & Darren Porter</i>	136
Examining Ocean Education in the Pacific Region	
Poetic Questioning, Ocean Gratitude <i>Robi Smith</i>	161
The Many Currents of Ocean Literacy: A case study of Ocean Wise Programming <i>Maria Albuquerque & David B. Zandvliet</i>	163
Improving Climate Science Knowledge Among Middle and High School Students with Authentic Data, Hands-on Activities, and Storytelling <i>Jennifer Putland, Maia Hoeberechts, Monika Pelz, Lauren Hudson, Cody Tolmie & Mauricio Carrasquilla</i>	189
Reflecting Nationally on Ocean Perceptions, Language, and Pathways Forward	
What do ranchers and heavy-duty mechanics say to the ocean? <i>Karen Tamminga-Paton</i>	213
Evaluating Ocean Perceptions and Ocean Values: The Canadian Ocean Literacy Survey <i>Lisa [Diz] Glithero & David B. Zandvliet</i>	216
Coming to Terms with Ocean Literacy <i>Sarah MacNeil, Carie Hoover, Julia Ostertag, Lilia Yumagulova & Lisa [Diz] Glithero</i>	233
<i>Reviewers</i>	253
<i>Guidelines for Contributors</i>	254

Guest Editorial

Reading the Ocean: Framing Ocean Literacy in Canada

Lisa (Diz) Glithero, Canadian Ocean Literacy Coalition & David B. Zandvliet, Simon Fraser University

This special issue of the *Canadian Journal of Environmental Education* focuses on varied, place-based relationships with the ocean (and water) across Canada and Turtle Island. It is also closely linked to the emerging relationships and socio-ecological challenges that we all face, both personally and as a society.

This issue comes at an historic moment of intense global uncertainty, exacerbated by the ongoing COVID-19 pandemic, as well as by the effects of rapid climate change, which continue to be experienced through increasing extreme weather events, rising temperatures, melting sea ice, and biodiversity loss. This escalating upheaval has exposed more clearly the interconnections between planetary health, human health, justice, and world economies. Multiple and growing social movements (#BlackLivesMatter, #LandBack, #FridaysforFuture, etc.) continue to demand systemic transformations shaped by principles of equity, justice, and accountability.

Within the broader global context and its multiple, intersecting challenges, it is easy to feel overwhelmed. However, in collective turmoil lies an opportunity: to critically examine our lives and experiences, our positionality and choices, our behaviours and actions, and our relationships with each other and with our communities. Perhaps most profoundly, there is also an opportunity to recognize and uphold the connections that fundamentally unite us, wherever we call home: the land, the water, and the ocean.

It can be said that Canada is uniquely blessed with an abundance of water. It is a country with over 8,500 rivers and an estimated two million lakes covering more than 11 % of Canada's total area (Statistics Canada, 2017). These waterways drain into one of five ocean basins that comprise Canada's coastline, the longest of any country in the world at over 240,000 kilometres (Statistics Canada, 2017). Eight provinces and three territories directly border the ocean and marine waterways, and an estimated 13 % of Canada's total population lives within 20 km of a marine shoreline (Mercer Clarke et al., 2016).

For coastal communities, Indigenous Peoples, and small-scale fishers, the ocean is linked to livelihoods, food security, well-being, and a rich cultural heritage. For over 27 million Canadians who live inland, this sense of ocean connectedness can be less tangible, though no less impactful. For instance, the ocean regulates our climate, absorbing 25–30 % of our carbon emissions and 80 % of the heat added to the global system (Intergovernmental Panel on Climate Change, 2018). The ocean and its resources provide over CA\$31 billion annually in gross domestic product and account for approximately 30,000 jobs (Fisheries and Oceans Canada, 2021). Fulfilling our basic needs, the ocean provides us

with oxygen, food, medicines, mineral, and energy resources. Simply put, the ocean is the determining life system on the planet; we cannot live without it.

Still, the cumulative impacts of human activity on marine ecosystems are increasingly evident in every corner of the world. If we are to understand, value, and care for the ocean and the waters that flow into it, we need to develop and describe a culture, an ethic, and a sense of connectedness that can enable this. These relational elements are emerging as part of a growing and internationally recognized field of research termed “ocean literacy.”

Following the first ever United Nations (UN) Ocean Conference in 2017, the UN Educational, Scientific and Cultural Organization released *Ocean Literacy for All: A Toolkit*. This publication was part of a growing recognition of the value of engaging citizens in the development of a “civic relationship with the ocean” (Santoro, 2017, p. 61). Further, ocean literacy was identified as a “societal outcome” for the UN Decade of Ocean Science for Sustainable Development (2021–2030). This suggests that with the current attention on ocean science, ocean protection, and the development of sustainable “blue growth” opportunities, educating, engaging, and empowering all citizens is also vital to this work. The role of educators and partners at all levels of the system, as well as in broader spaces of knowledge sharing is essential to mobilize a citizenry that understands, values, and acts with ocean (and water) health in mind.

This special issue is supported by the work of the Canadian Ocean Literacy Coalition (COLC), a bottom-up, community-driven alliance of regional and national organizations, networks, institutions, communities, and individuals who have come together to better understand and advance ocean literacy in Canada. COLC launched at the Oceans Inspiration Expo in September 2018 as part of the G7 Ministerial Meetings in Halifax, Nova Scotia. From 2019–2020, COLC led the national research initiative, *Understanding Ocean Literacy in Canada*. The project, facilitated by an all-women research team of national and regional coordinators, examined how ocean literacy is understood and practised across five Canadian regions (Pacific, Inuit Nunangat, Atlantic, St. Lawrence, and Inland Canada), as well as within 10 sectors: Government, Non-Governmental Organizations (NGO) and Foundations, Research, Industry, Education, Youth, Community, Media, Arts and Culture, and Health. Using a mixed methods approach, the study engaged with over 3,000 Canadians and more than 400 organizations to identify enablers of, gaps in, and barriers to ocean literacy in Canada. The regional and national priorities and recommendations that emerged directly informed the co-development of *Land, Water, Ocean, Us: A Canadian Ocean Literacy Strategy*.

This issue is therefore organized to include diverse regional and cultural voices of community members, academics, professionals and practitioners, from coast to coast to coast. The issue features original artwork and complementary statements from five artists, all linked to COLC’s Canada-wide study, and all offering critical reflections on community-level conversations with Canadians.

Each artist focused on the shared research question, “If you and the Ocean spoke the same language, what would be said?” These contributions form an important context, and they frame each section in which the research appears.

The remaining articles present important ocean literacy-related research, some of which is independent of and some of which is emergent from COLC’s work. All of these voices, perspectives, critical insights, and forward-looking solutions are essential to ongoing discussions about ocean literacy. As guest editors, we are most grateful for the opportunity to compile these efforts into a unique volume: an *ocean literacy reader*. What follows is a summary of the ideas and research we share with you in this special issue.

We open the issue with an overarching context piece—a community perspective essay authored by Anne Stewart, marine educator and founder of the Canadian Network for Ocean Education (CaNOE). Initiated in 2014, CaNOE’s active membership of educators and community practitioners engaged in a multi-year conversation to collectively answer a question, which also forms the essay title, “What is Canadian Ocean Literacy?” CaNOE’s co-developed community response is presented in the form of Stewart’s essay. It provides important context for the challenges and considerations of ocean literacy unique to Canada.

We then head into the first section of our issue, which is focused on understanding Indigenous land- and sea-based ways of knowing. As editors, we believe it is essential that perspectives of the First Peoples of the land (now known as Canada) are presented first. This section is composed of one poem, one artist’s statement, and three research articles focusing on Indigenous perspectives. Siku Allooloo, an Inuk/Haitian Taíno writer, artist, and land-based educator from Denendeh (“Land of the People”), Northwest Territories and Pond Inlet, Nunavut, sets the tone as she speaks of Indigenous community revitalization through the poem, “Offering.” Becky Okatsiak, from Rankin Inlet, Nunavut, shares a painting of Nulijuk (or Sedna), “our sea goddess,” and personal reflections on her relationship with the ocean (and sea ice) as a young Inuk in “One with the Ocean.”

Following these artistic contributions are several important research works, beginning with “DamXan gud.ad t’alang hllGang.gulXads Gina Tllgaay [Working together for a better world].” In this article, Barbara Wilson, Haida matriarch and scholar articulates how coastal Indigenous communities are facing ongoing colonization while they are attempting to address the impacts of rising sea levels and climate change. She argues that re-infusing Indigenous values is important for rebuilding and maintaining healthy and resilient communities, which are then empowered to reduce the impacts of climate change on our oceans. Taken together, this Indigenous knowledge and values system is a key and critical component of “ocean literacy” in all of its forms. Following this article, Larry (Shucks) Nahanee, Chiaxten Wes Nahanee, Lilia Yumagulova, Kathleen Sperry, and Jonathon Reynolds tell the story of the revival of the Skwxwú7mesh ocean-going canoe and traditions in “Canoe as a Teacher,” particularly through a

description of the annual Tribal Canoe Journeys. Through the stories, reflections, and teachings shared by Wes and Shucks, the paper considers how Indigenous pedagogies are attained through canoe journeys, particularly in the urban Indigenous context. This section on Indigenous perspectives concludes with a case study article by northern-born (and non-Inuk) scholar, Heather McGregor, who examines a Polar Regions-focused environmental education and youth leadership development program. She does so through a detailed case study identifying program components that are uniquely important to engaging a specific group of learners: Inuit youth from the circumpolar Arctic.

The second section in this issue is dedicated to exploring ocean pedagogy in Quebec and Atlantic Canada. It begins with artists Nancy Breton (Quebec) and Jane Affleck (Prince Edward Island), who share their reflections on community responses to their ocean-themed paintings. Next, Francophone researchers, Émilie Morin, Geneviève Therriault, Barbara Bader, and Dany Dumont examine “Une démarche éducative pour susciter les apprentissages et développer le pouvoir d’agir chez les jeunes Québécois du secondaire avec un accent particulier sur l’activité de développement durable dans la région du Saint-Laurent [An educational process to stimulate learning and develop the power to act in young high school-aged Quebecers, with a focus on sustainable development activity in the St. Lawrence region].” The authors explore the significant learning experiences of 26 youth, aged 15-16, in relation to a developing sense of agency, and offer a thematic analysis of students’ comments shared during facilitated activities along the St. Lawrence. Following this, scholar Noémie Roy describes case study research on how a rural Quebec community on the St. Lawrence Estuary mobilized to save a middle school from closing by creating an innovative, place-based program connecting curriculum to concepts related to the St. Lawrence River and the Atlantic Ocean. Finally, the section is rounded out by an article focusing on community-based ocean literacy, led by Julia Ostertag (COLC researcher) and 18 contributing authors. This article highlights four case studies of ocean optimism from Mi’kma’ki/Atlantic Canada.

The third section examines ocean education programming specific to the Pacific Region. It begins with artist Robi Smith’s arts-research reflection, “Poetic Questioning, Ocean Gratitude.” This piece is followed by an article describing a collaborative research study with Ocean Wise, a Vancouver-based NGO with international reach based out of the Vancouver Aquarium. This case study, co-authored by Maria Albuquerque and David Zandvliet of Simon Fraser University, examines the efficacy of various forms of ocean literacy programming offered by Ocean Wise and includes rich qualitative data about participants’ experiences with the programs. The Pacific section concludes with an article co-authored by program staff and researchers from Ocean Networks Canada that provides an evaluative critique of lessons focused on improving ocean-climate science knowledge in middle and high school students through the use of authentic data sets.

The concluding section of our special issue offers perspectives and findings related to ocean literacy on a national scale. This section begins with an arts-research reflection from Alberta artist and teacher, Karen Tamminga-Paton, entitled “What Do Ranchers and Heavy-Duty Mechanics Say to the Ocean?” This piece is followed by two research articles. Our own research article (Lisa [Diz] Glithero and David B. Zandvliet) describes the development, validation, and key findings of the Canadian Ocean Literacy Survey, an evaluative tool created and used by the COLC research team and its partners as part of a national, mixed methods research study on ocean literacy. The survey research uncovers patterns in ocean awareness, perceptions, and values for Canadians as well as their behavioural intentions and actions. The final article of the issue, entitled “Coming to Terms with Ocean Literacy,” is co-authored by COLC’s research team. In it, the team discusses the challenge of contextualizing “ocean literacy” as an international term within Canadian contexts and the potential inadequacies of the term in encapsulating different worldviews and diverse linguistic communities.

The release of this special issue is intentionally aligned with World Oceans Day, an internationally recognized and globally celebrated event initially conceived by Canada’s International Centre for Ocean Development (ICOD) in Halifax, Nova Scotia, in 1991. World Oceans Day was launched on behalf of the Government of Canada at the Global Forum of the UN Conference on Environment and Development (Earth Summit) in Rio de Janeiro, Brazil, in 1992. Each year on June 8th, volunteers and community organizations around the world mobilize thousands of youth, educators, families, and community organizations to celebrate and help maintain the health of the ocean. In Canada, existing efforts such as Oceans Week Halifax and Oceans Week Victoria are uniting under the banner Ocean Week Canada to highlight, coordinate, support, and inspire events in communities from coast to coast to coast. You can join this growing national effort at www.oceanweekcan.ca.

In solidarity with these efforts, the overarching aim of this special issue is to raise and strengthen the profile of the emerging field of ocean literacy in Canada and to better position Canada as an active collaborator and contributor to ocean (and water) literacy research internationally. Here and abroad, ocean advocates, educators, scholars, natural and social scientists, innovators, entrepreneurs, artists, storytellers, and many others recognize the opportunities that await us. With accelerating global attention on (restoring) ocean sustainability, our collective goal over the next 10 years of the UN Decade of Ocean Science for Sustainable Development must be to transform ocean–climate knowledges into societal changes. These changes must be felt in the behaviours and actions of all citizens, across scales, sectors, regions, cultures, and worldviews in order to ensure that this renewed focus on ocean sustainability succeeds. As guest editors, we invite you to join Canada’s growing ocean literacy community of actors, read the recently launched *Land, Water, Ocean, Us: A Canadian Ocean Literacy Strategy*, and get involved at www.colcoalition.ca.

Acknowledgements

As guest editors of this volume of *CJEE*, we would like to thank several people who contributed to its publication.

The first acknowledgement is to editors Pat Maher and Blair Niblett. We are grateful that they have given us the opportunity to dedicate a volume of *CJEE* to ocean (water) literacy, especially at this time, to align with the launch of *Land, Water, Ocean, Us: A Canadian Ocean Literacy Strategy* and the start of the UN Decade of Ocean Science for Sustainable Development. We also thank them for their support and guidance throughout the editing and publication processes, as well as for their flexibility as we navigated the impacts of the COVID-19 pandemic on the publication timeline.

Further, we would like to thank our reviewers drawing from the *CJEE* network, the Institute for Environmental Learning at Simon Fraser University, and scholars from within the COLC community. Your critical efforts and expertise ensured that a large number of manuscripts were reviewed in a timely manner while ensuring the high publication standards of *CJEE* were maintained.

We also wish to thank Poh Tan and Daniel Ferraz, both graduate students at Simon Fraser University, for their editorial assistance and support during the final copy-editing stage. Lastly, we extend our deep gratitude to all contributing authors and artists. We are especially grateful for the artists' permission to include the use of their original artwork on the cover. We also extend our deep gratitude to Rusty Brown for the cover design and layout of the full issue. Finally, we extend a special thanks to Julie Sutherland for her exceptional copy editing suggestions made during the final stretch to publication.

Together, we have brought this special issue to life. As guest editors, we are proud and honoured to have been granted the trust and support to bring together a diverse compilation of perspectives across regions, cultures, and languages from coast to coast to coast.

References

- Fisheries and Oceans Canada (2021). *Blue Economy Strategy Engagement Paper*. Retrieved January 21, 2021, from <https://dfo-mpo.gc.ca/about-notre-sujet/blue-economy-economie-bleue/toolkit-trousse/engagement-paper-document-mobilisation-eng.html>
- Intergovernmental Panel on Climate Change [IPCC] (2018). *The Carbon Cycle and Atmospheric Carbon Dioxide*. Retrieved January 8, 2021, from <https://www.ipcc.ch/site/assets/uploads/2018/02/TAR-03.pdf>
- Mercer Clarke, C.S.L., Manuel, P. and Warren, F.J. (2016). The coastal challenge. In D.S. Lemmen, F.J. Warren, T.S. James and C.S.L. Mercer Clarke (Eds.), *Canada's marine coasts in a changing climate* (pp. 69-98). Government of Canada.
- Santoro, F., Santin, S., Scowcroft, G., Fauville, G., and Tuddenham, P. (2017). *Ocean Literacy for All - A Toolkit*. IOC/UNESCO & UNESCO Venice office Paris (IOC Manuals and Guides, 80 revised in 2018), 136.
- Statistics Canada (2017). *Canada Day... by the Numbers*. Retrieved January 13, 2021, from https://www.statcan.gc.ca/eng/dai/smr08/2017/smr08_219_2017

What is Canadian Ocean Literacy?: A Community Perspective Essay

Anne Stewart, Founding Director and former Co-chair of the Canadian Network for Ocean Education (CaNOE)

This essay is crafted out of the many responses to the question “What is Canadian Ocean Literacy?”, which was asked of participants during dialogues, workshops, and conferences facilitated by the Canadian Network for Ocean Education (CaNOE) between 2013 and 2018. CaNOE is a (sea)grassroots, volunteer-run, non-profit society that works to advance ocean literacy in Canada by stimulating dialogue and communication about ocean literacy and by celebrating and showcasing current efforts in ocean literacy. CaNOE supports its cross-Canada membership of educators, community practitioners, and supporters through communication, national conferences, training opportunities, and learning resources. The response given here is only a starting place that may help shape what Canadian ocean literacy becomes in the third decade of the 21st century.

Context

National discussions on the definition of Canadian ocean literacy began at a workshop, which was hosted by Ocean Networks Canada in June 2013 at the Canadian Environmental Education and Communication Network (EECOM) Conference at the University of Victoria, British Columbia. Prior to those discussions, Canadian ocean literacy was generally indistinguishable from the Ocean Science Literacy Framework and its action statements, first published in the United States in 2005 (National Oceanic and Atmospheric Administration [NOAA], 2013) and adopted by several other countries, mostly in the European Union. The Framework’s ocean science content now includes seven essential principles and 45 fundamental concepts, and its science knowledge content continues to be appropriate, recognized internationally, and kept current by ongoing efforts by the National Marine Educators Association (NMEA), among other groups. Despite offering a tidy answer to a tricky question – that is, ocean literacy is an “understanding of the ocean’s influence on us and our influence on the ocean” (NOAA, 2013), the Framework misses pertinent points within the Canadian context. For example, in Canada, we must be able to succinctly and enthusiastically explain Canadian Ocean Literacy in French, English, and as many Indigenous languages as possible—a linguistic diversity that is absent from the Framework.

Building on the 2013 EECOM workshop, and driven by the question, “What is ocean literacy in Canada?”, CaNOE (<http://oceanliteracy.ca/>) facilitated an

interactive workshop at the Northwest Aquatic and Marine Educators (NAME) Conference in July 2013. The question was asked again during a roundtable discussion at CaNOE's first national ocean literacy conference in June 2015 in Vancouver, British Columbia, "Canadianizing Ocean Literacy". The question was further explored by CaNOE's Education and Outreach Working Group in 2016 and then again during subsequent conferences on the Atlantic coast of Canada (CaNOE 2016 Halifax, Nova Scotia; EECOM 2017 Wolfville, Nova Scotia; CaNOE 2018 St. John's, Newfoundland).

Identified early in CaNOE's efforts in Canada was a desire for a unique and diverse Canadian knowledge approach to ocean literacy—one that is not only interdisciplinary and inclusive but that also inspires action. Three key themes emerging from the discussions in the abovementioned events demonstrated ways in which Canadian ocean literacy differentiated itself from ocean literacy in other countries. These themes and their sub-themes recurred through all iterations of CaNOE's co-developed community response to the title question. The three themes were as follows:

1. Respecting and recognizing diverse First Nations, Métis, and Inuit perspectives, laws, and ways of knowing without appropriation. Globally, this diversity of viewpoints appears to be missing in other ocean literacy understandings.
2. Highlighting the fundamental importance of ocean conservation and sustainability within Canadian Ocean Literacy efforts are elements that can be lost in a science-only approach; and
3. Including economic, emotional, spiritual, and aesthetic considerations, which may be crucial for instilling ocean literacy values in learners and igniting normative behavioural changes.

Each theme moves Canadian ocean literacy beyond ocean science content and towards a more holistic understanding of the ocean.

CaNOE's quest for a Canadian response to the title question culminated in its third national conference on ocean literacy in St. John's, Newfoundland in July 2018. The response outlined below includes results of an extended workshop on Canadian perspectives on ocean literacy at the above event. The purpose of the two-part workshop was to gather participants' views on identified gaps in ocean literacy in Canada. Part 1 was held as a single-track portion of the conference after the opening plenary, to maximize attendees' participation. Each participant's opinions were collected during the workshop through a mass interviewing process (i.e., Interview Matrix), followed by theme analyses and point form summaries done by volunteers during the conference. Part 2 took place at the end of the conference and consisted of a review and discussion of the analyses and summaries, enabling further input by participants in working groups. Findings were further refined by volunteers for the workshop report. Findings also contributed to the creation of a community perspectives'

statement (Stewart, 2019) and provided a general picture of Canadian Ocean Literacy. This statement, among other important points, identifies the need to enhance the response to the question “What is Canadian Ocean Literacy?” with diverse voices. This essay is, in part, a response to that recognition. It extends the 2019 statement by providing additional input and perspectives gathered up to this point. Since 2018, CaNOE has supported the Canadian Ocean Literacy Coalition’s efforts (<https://colcoalition.ca/>) to be an active leader in examining ocean literacy in Canada through a more academic, regionally-driven, multi-sectoral, and multi-organizational approach in order to strengthen and advance ocean literacy in Canada.

Ocean What?

The *Oxford English Dictionary*’s first definition of literacy is the “ability to read and write”; however, the second definition—“a competence or knowledge in a specified area”—best fits the phrase “ocean literacy,” albeit loosely. The ocean is very large, and there are many diverse areas of competency or knowledge. The term “ocean literacy” was truncated from “ocean science literacy” in the United States by the consensus-based movement of scientists and science educators who developed the Ocean Science Literacy Framework. They worked together to counter a lack of ocean topics in schools and a lack of ocean science literacy in society. Some countries, such as France, have developed their own approaches (Charette-driven) to combat the shortage of ocean topics being taught in schools; nonetheless, the term “ocean literacy” and the U.S. Framework are widely well received in Europe, despite difficulties in translating the word “literacy.”

Challenges to, and possible solutions for, integrating ocean topics in schools were studied in eight European countries, (Belgium, Denmark, Greece, Sweden, Ireland, Portugal, Spain, UK) through the European Union’s *Sea Change Project* (Fauville et al., 2018). The barriers found in these countries are also present in Canada, demonstrating that Canadians are not the exception but the norm in terms of ignoring ocean topics in curriculum, teacher training, and textbooks. These challenges were also reflected in the work done by Guest et al. (2015) in Nova Scotia.

As the Canadian Ocean Literacy movement attempts to bridge educational and community engagement gaps, the meaning of “ocean literacy” in Canada still needs to be addressed. While the phrase may continue to vex ocean literacy proponents and practitioners nationally and internationally, its use has become more widespread and is becoming a recognized part of ocean science literacy. Ocean Literacy is now embedded as an identified societal outcome (i.e., #7 *An Engaging and Inspiring Ocean*) in the Intergovernmental Oceanographic Commission (IOC) of UNESCO-led United Nations Decade of Ocean Science for Sustainable Development (2021-2030). While knowledge of ocean science is a

significant part of ocean literacy, Canadians distinguish themselves by bringing diverse ways of knowing into play that shape a distinctively Canadian ocean literacy viewpoint.

Diverse Perspectives

The diverse perspectives discussed below reflect some of the ways in which the ocean is significant to Canadians. They also point to a few of the many complexities involved in becoming a more ocean literate society.

From an *ecological perspective*, ocean ecosystems sustain life by providing oxygen, food, climate regulation, and support for all life on the planet. Although considered by ocean science educators to be the Framework’s “low-hanging fruit,” the majority of Canadians, who live busy, modern lives far from the sea, perceive these abstract concepts as having little relevance to them.

From an *economic perspective*, the ocean economy significantly contributes to Canada’s GDP and provides employment in vessel design and construction, marine transportation, trade, high-speed digital communications, resource extraction, and more. The average Canadian, however, tends not to see these economic engines at work, and they often fail to understand how these offer career opportunities for youth.

From a *jurisdictional perspective*, most of our global ocean is outside national law, with the exception of the Exclusive Economic Zones, which run along shorelines of nations. While Canada has the longest shoreline in the world, a big responsibility in itself, it is also party to international agreements that pertain to shared parts of the global ocean. An example pertinent to Canadian ocean literacy is the Galway Statement on Atlantic Ocean Collaboration (2013), which explicitly includes advancing ocean literacy amongst citizens of nations, including Canada, who are signatories to the statement.

From an *educational perspective*, the commitment to ocean literacy is part of a Canadian jurisdictional conundrum, in that formal education is mostly a provincial and territorial jurisdiction while ocean literacy is a federal commitment. A possible solution to this problem would be to support and augment the role of the already active players in environmental education (from the tops of watersheds to the sea) while strengthening ocean science literacy at events such as National Science Literacy week, science fairs, and STEM-focused teacher professional development.

In the post-secondary learning environment, most oceanic knowledge is siloed to specialized areas of study or specific courses, such as oceanography, marine biology, and marine geology; thus, most post-secondary students in Canada do not learn about the ocean unless they are themselves motivated to do so. Canadian university ocean sciences programs do not generally use the term “ocean literacy,” with the exception of Ocean Networks Canada at the University of Victoria, the Marine Institute at Memorial University, and the

Ocean Frontier Institute based at Dalhousie University. These organizations also explicitly engage in ocean science literacy promotion, reach out to learners who are not ocean science specialists, and engage the public (e.g., lifelong learners, youth, teachers, communities, artists).

From an *arts and culture perspective*, the ocean continues to be an important muse for creative people. This quote from the Transatlantic Ocean Literacy Workshop in Lisbon, Portugal in 2016, and the questions posed within, also apply to distinct Canadian arts and culture: “The ocean inspires. The ocean has always connected civilizations and made cultural exchanges possible. How can we highlight these dimensions in ocean literacy? And how can we use them to raise awareness of the importance of the ocean for society?” (AORA, 2016). Canadian artist Katherine Burns’s paintings, as an example, epitomize the sea as muse. This can be seen as well in the art of master Haida artist Robert Davidson, in which the sea, family, and cultural connections are entwined and enshrined. These are just two examples among many of Canadian artists, musicians, songwriters, dancers, and poets who are inspired by the sea and whose creative work has the power to inspire others.

From a *coastal perspective*, the ocean is socially important in terms of sharing seafood with family and community, celebrating connections with the sea through festivals and events, and carrying on family traditions of cultural ceremonies and practices that connect individuals to the ocean. It is important to celebrate these cultural connections for their own intrinsic value and for their potential to instill in people a love and reverence for the sea, to improve stewardship practices promoting care, and to help people recognize the significance of relationships with the natural world through an understanding of our kinship with oceanic life forms.

From an *emotional perspective*, even people who are afraid of the sea can love and appreciate it. The sound of the sea can soothe us, and the sight of it can touch our hearts. This appreciation is often reflected in modern digital technologies. Furthermore, the sea can be an important spiritual mediator that can help people relax, reflect on their own purpose and spirituality, and feel gratitude. In highlighting these socio-cultural and socio-emotional links, we do not intend to reduce the significance of ocean science knowledge to ocean literacy, but we do aim to show how these links, rooted in deeply held values, may add powerful vectors for change in ocean literacy and eventually in ocean sustainability.

Respecting Different Ways of Knowing

Canadian science is becoming more and more open to recognizing and respecting traditional knowledge in ocean science. Although for many it is not happening quickly enough, the Eurocentric science perspective is nevertheless being broadened to incorporate other ways of knowing. An example of this expansion

can be seen in a recent crab co-management agreement, which stemmed from Coastal First Nations signing a Fisheries Reconciliation Agreement with the federal government. The agreement took four First Nations working together for 14 years to negotiate. As we continue to shape Canadian Ocean Literacy, it is clear that Indigenous leadership and multiple Indigenous perspectives are important. Canada's Truth and Reconciliation Commission's Calls to Action instruct Canadians to counter our tragic histories and genocidal residential school legacies. Heeding that instruction as we develop what ocean literacy means in Canada and what it will become is part of what will differentiate Canadian ocean literacy from that of other countries.

From 2013 to 2018, many educators and community practitioners across Canada contributed to the CaNOE dialogue about Canadian ocean literacy. The discussions showed that Canadians are in general agreement with Americans with regard to ocean literacy being about our reciprocal relationship with the ocean. However this relationship is more involved, complex, and holistic than previously acknowledged by the American ocean science literacy model. Indigenous ways of knowing may offer essential starting places and foundations for strengthening our understanding of and relationship with the ocean. Varied and distinct ancient wisdoms have parallels with the modern ocean sustainability movement. For instance, both ancient and modern wisdoms prioritize our relationship with the sea and our dedication to preserving it for future generations. Although very different, both ancient and modern wisdoms distinguish relationships of pure exploitation from mutually beneficial relationships that include reciprocity, obligation, and responsibility.

A vital difference between Canadian models of ocean literacy and those found in the United States, Europe, and other nations is that Traditional Indigenous Knowledge and Inuit Qaujimaqatugangit (IQ) are increasingly becoming more recognized and respected in Canada. These laws and ways of knowing about sustaining water, ocean, and land span very long time frames and bring responsible, stewarding worldviews to the national identity of ocean literacy.

Transforming Science and Education

Conventional academic hierarchies of science are also starting to level out, both in Canada and internationally. In my opinion, evidence of research and knowledge dissemination being decolonized appears in the form of an increasing number of open access journals, more crowd-sourced data, and improved citizen/community science. Both science and science education are evolving into a more process-oriented approach, wherein learners and citizens model *doing science* rather than just learning "the facts." These changes in science and science education may also accelerate more active participation in ocean literacy by youth and groups who are sometimes under-represented in science (e.g., women, Indigenous peoples, peoples of colour, etc). These trends are

important to defining Canadian ocean literacy and how we choose to navigate the concept moving forward.

Pedagogical approaches to science education in the 21st century include experiential, inquiry, project, and place-based learning as ways to promote critical thinking, creativity, and innovation for meaningful learning through doing. Canadians also see value in interdisciplinary learning (Woolf, 2017), and many educators who have already overcome the challenges of including ocean topics in curriculum use ocean examples as a means to integrating ocean learning within and across broader subjects and units of study. For example, teachers in many provinces are linking ocean acidification with atmospheric carbon dioxide and climate change in their Chemistry 11 classes, where required learning outcomes about bases and acids otherwise have nothing to do with ocean literacy. Another example is that educators are supporting students to use real ocean data from Ocean Networks Canada's Ocean 2.0 to meet mathematics learning objectives with regard to data visualization and graphing. Teachers are also successfully using visits to local waterways and nature to link ocean learning to students' everyday lives through field trip data collection, visual art, or even Haiku poetry writing sessions.

The ocean is especially important to coastal people, but it has an influence on all Canadians, the majority of whom live away from the coast and are only linked to the ocean through freshwater. What is more, all Canadians influence the ocean. Wherever we live, we are connected to each other and to life through water that all originates from the ocean and of course flows downhill, eventually returning to the sea. Canadian ocean literacy has an underlying goal of achieving a healthy, productive ocean that is recognized and revered as the planet's life support system. Fundamental to Canadian ocean literacy is our responsibility to care for the health of water, whether it be freshwater or salty. Making freshwater connections to the sea is one way to help all learners become more ocean literate. Perhaps water can be a common denominator to pull us together for ocean literacy.

It does seem strange that the ocean, a defining feature of our planet, has been overlooked in Canadian school systems and by Canadian society in this era of expanding human populations, increased ecological impacts, climate change, and declining ocean biodiversity. We know that the ocean is finite (we can measure its volume), and Chapter One of the United Nations' 2016 World Ocean Assessment clearly demonstrates how important the ocean is to us individually and collectively. It also clarifies that there are limits to what we can take without giving back. By understanding how the ocean functions, we have a better chance of learning how to be more responsible with respect to our impacts on the ocean. This understanding is an important aspect of Canadian Ocean Literacy. Ocean conservation science is also about managing people and their behaviours, and ocean literacy may well be an under-utilized tool in the ocean conservation toolbox. Modern education, which includes life-long,

not just grade school, learning could be key to turning the tide on both ocean conservation and ocean literacy.

Education along with science, traditional ways of knowing, laws, policies, and sustainability efforts can all help pull us “towards the ocean we need for the future we want” (IOC-UNESCO, 2017). Mutually beneficial collaborations between diverse people and regions can further inspire an ocean literate Canada. In this large country, with shorelines on three ocean basins, a vast freshwater network, and distinct regional and cultural perspectives, the definition of Canadian ocean literacy is both clear and fluid. We cannot do it alone, and the only hope we have of navigating toward a more ocean literate Canadian society is by respectfully working together.

References

- Atlantic Ocean Research Alliance. (2016). WP8 Ocean Literacy: Lisbon Transatlantic Ocean Literacy Workshop. Retrieved from: <https://ec.europa.eu/research/participants/documents/downloadPublic?documentIds=080166e5adc294e9&appId=PPGMS>
- Fauville, G., Mchugh, P., Domegan, C., & Makitalo, A. (2018). Using collective intelligence to identify barriers to teaching 12-19 year olds about the ocean in Europe. *Marine Policy*, 91, 85-96. https://www.researchgate.net/publication/324868714_Using_collective_intelligence_to_identify_barriers_to_teaching_12-19_year_olds_about_the_ocean_in_Europe
- Galway Statement on Atlantic Ocean Cooperation. (2013). Retrieved from <https://atlanticresource.org/aora/sites/default/files/GalleryFiles/Default/GalwayStatement.pdf>
- Guest, H., Lotze, H. K., & Wallace, D. (2015). Youth and the sea: Ocean literacy in Nova Scotia, Canada. *Marine Policy*, 58, 98-107. <https://doi.org/10.1016/j.marpol.2015.04.007>
- IOC-UNESCO. (2017). *The Ocean We Need for the Future We Want*. Intergovernmental Oceanographic Commission (IOC) of UNESCO. http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/pdf/IOC_Gatefold_Decade_SinglePanels_PRINT.pdf
- National Oceanic and Atmospheric Administration (NOAA). (2013). *Ocean literacy: The essential principles and fundamental concepts of ocean sciences for learners of all ages* (Version 2). First published June 2005, revised March 2013. <https://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf>
- Stewart, A. (2019). *What is Canadian ocean literacy?* http://oceanliteracy.ca/wp-content/uploads/What-is-Canadian-Ocean-Literacy-Nov_19.pdf
- Woolf, D. (2017). The future is interdisciplinary. Originally published in *The Hill Times* on November 3, 2017. <https://www.univcan.ca/media-room/media-releases/the-future-is-interdisciplinary>

Offering

Siku Allooloo

I have always been ocean
between great distant islands
holding them in closely wrapped depths
a wide expanse of stories without ends
Sometimes water, sometimes sea ice
always flowing
Restless
Blessed and stretched
and often torn
Sometimes too full with all the grief
of holding
all of this terrible complexity
all of these beloved island anchors
that anchor me, and give ground
knowing that ground has always escaped me
and all I really know is how to drift

A solitary, lonely gift
to sense from silent spaces
buried needs we can never admit
So I spend this life
searching
searching
pulled by the moon

As I settle to my bottom I can see it
beyond the devastation and losses, this perpetual state
the faint trace of inertia
particles of lifetimes forgotten
spanning across unfathomable distance
Like sun warmth on your face in the pit of winter
a mother's caress long after she has passed on

Perhaps my deepest urge
for uninhibited love
for children to raise in our richness, close to the earth
to give them my body and my life
until there is nothing left to give
and we are all overflowing

Perhaps these are seeds that will blossom in them
the ones yet to come
the ones we must deliver safely
across

Perhaps my spirit is dreaming
and my heart is in prayer

My hands will keep building
My mind will keep working
My life will keep searching
 newfound ways to bring you through

Maybe I am tobacco
laid on the earth
imbued with ancient prayers
from palms of ancestors

Maybe I am the smoke that rises
with the offering

Maybe these pulls
are the migration paths of caribou
too long unfulfilled
on verge of return
from spirit world to new form

In the afterlife my joy will be
to graze your cheeks with loving warmth
as we beam at you with pride
knowing that at last
 our job is done
 your time has come
 The cycle, now stronger
 will continue

One With the Ocean

Nulijjuk, or Sedna, is one of many legends from our Inuit culture. Nulijjuk, our sea goddess, was an Inuk woman who was thrown into the sea after she refused to marry. She is the key to how our sea mammals came to form and live. She is at the forefront of our connection with the salt waters. I had painted her portrait with the inspiration of the connection and respect we have for our waters, and the mammals that live in it, in mind. Inuit depend on the ocean to hunt and travel whether it be summer or winter.

Over the years of painting in my spare time, I have naturally gravitated towards portraits of women with traditional Inuit tattoos, as seen in this portrait. I wanted to show her beauty through my eyes and humanize her to give the audience some perspective on what she would have looked like. With my art, I choose to show the beauty of our culture, as I am passionate about educating others about my Inuit traditions and history; art is a good way for storytelling.

I grew up fishing with my dad with his gill nets by our cabin near the shore (Hudson's Bay) every summer. There were some amazing opportunities to see seals and beluga whales from our cabin down at the shore, which was pretty cool as I had only seen them on the dinner table or on the cardboard tables at feasts. It gave me a newfound appreciation for our hunters and our connection to the sea and its mammals.

This project allowed me to reflect on our history and traditions around the ocean and sea ice. It also brought back many memories, whether it was being back at home or out on expeditions with Students on Ice where I worked from 2018 to 2020. I hope that future generations of Inuit are able to have similar experiences and appreciate our history, culture, connection to the ocean, and the food it has to offer.

DamXan gud.ad t'alang hllGang.gulXads Gina Tllgaay (Working together to make it a better world)

Kii'ljuus Barbara Wilson, Haida Nation, Simon Fraser University

Abstract

This article is a compilation of my thoughts based on interviews with the (coastal) village residents of Skidegate, Haida Gwaii. I asked, How can we make our communities healthy and able to withstand the rising winds, waters, more extreme temperatures, and droughts, all of which are related to climate change? How can we use our ancient kil yahdas (spoken laws) to empower our Nation to uphold our values of Yahguudang (respect), Ista ad isgid (reciprocity), Gud 'Laa (consensus), Tll'yahdah (make things right), and 'Laa guu ga kanhlln (stewardship) to create a safe, healthy planet, including the ocean, for present and future generations? Study participants identified the need for more education on climate change impacts and the reinvigoration of ancestral laws. Colonization is discussed throughout this research because of the impacts it has had and continues to have on our life ways. The removal of Canadian legislation, such as the Indian Act, Species at Risk Act, and Fisheries Act, and the revitalization of ancient laws lived for thousands of years, which taught the Kuuniisii (the ancestors) to live respectfully with all aspects of the earth, is needed. These ancient laws offer respect and interdependence, as well as control over our Nation and other nations collectively. Currently, Indigenous communities are facing ongoing colonization while attempting to address the impacts of climate change. Reinfusing our kil yahdas (spoken laws) and kuuya (precious things or values) is important for rebuilding and maintaining healthy and resilient communities and strong governance. We hope that this reanimation will reduce the impacts of climate change, especially on our ocean.

Résumé

Cet article rassemble les réflexions inspirées d'entrevues menées dans le village côtier de Skidegate, dans les îles Haida Gwaii, pour répondre aux questions suivantes : « Comment pouvons-nous assurer la santé et la résilience de nos collectivités devant l'intensification des vents, la montée des eaux, les températures extrêmes et la sécheresse, tous des problèmes dus aux changements climatiques? Comment pouvons-nous faire appel à nos anciennes kil yahdas (lois orales) pour donner à notre Nation le pouvoir de défendre nos valeurs, c'est-à-dire Yahguudang (respect), Ista ad isgid (réciprocité), Gud 'Laa (consensus), Tll'yahdah (réparation) et 'Laa guu ga kanhlln (responsabilité écologique) pour faire de la planète, et de l'océan, des endroits sûrs et sains pour les générations présentes et futures? » Selon les participants à l'étude, nous devons augmenter la sensibilisation aux changements climatiques et revitaliser les lois ancestrales. La présente recherche aborde aussi le sujet de la colonisation, vu ses répercussions passées comme présentes sur notre mode de vie. Certaines lois canadiennes sont dépassées, comme

la Loi sur les Indiens, la Loi sur les espèces en péril, et la Loi sur les pêches, et il faut redonner leur juste place aux anciennes lois millénaires, qui ont enseigné aux Kuuniisii (les ancêtres) à vivre en harmonie avec la Terre dans sa globalité. Ces lois anciennes célèbrent le respect et l'interdépendance et permettent à notre Nation, et aux autres Nations collectivement, de contrôler leur destin. À l'heure actuelle, les Autochtones subissent toujours la colonisation et doivent en plus s'adapter aux changements climatiques. Nous devons réintégrer nos kil yahdas (lois orales) et nos kuuya (valeurs ou choses précieuses) pour rebâtir et conserver la santé et la résilience de nos communautés, de même que pour en solidifier la gouvernance. Nous espérons que cette revitalisation atténuera l'impact des changements climatiques, particulièrement sur notre océan.

Keywords: tll'yahdah (*make things right*), kil yahdas (*spoken laws*), yahguudang (*respect*), climate change, decolonization, *Indian Act*

Mots-clés : réparation, lois orales, respect, changements climatiques, décolonisation, *Loi sur les Indiens*

Gina Gansda Suu (Introduction)

With increased evidence of climate impacts globally (Bush et al., 2014; Kolbert, 2015) and the rising cost of energy (Jang, 2015), First Nation communities in Canada and other Indigenous communities around the world are faced with the challenge of minimizing their energy demands and carbon footprint with limited financial capital to implement both traditional and new technologies. This is particularly acute in remote (coastal) Indigenous communities which experience disproportionate levels of impact from rising waters, lack of food security, and poverty (United Nations [UN], 2009). First Nations communities bear the cost and legacy of fossil fuel intensive energy sources, such as diesel, oil and coal, and constrained economic opportunities (Mackey & Strathdee, 2015). Knowing that emitting carbon dioxide and methane into the atmosphere has caused an imbalance, we must do our part to assist Mother Earth's attempt to tll yahda (*make things right*).

Haida knowledge and perceptions of climate change impacts and solutions on XaaydaGa Gwaay.yaay (*Haida Gwaii*), British Columbia, Canada are examined in this paper. Specifically, my research addresses the following research question: How can we make our communities healthy and able to withstand the rising winds, waters, more extreme temperatures, and droughts, all of which are related to climate change?

I surveyed Haida stories and the knowledge held by the residents of HI Gaagilda Llnagaay (Skidegate Village) to achieve the following: 1) document traditional knowledge of climate change, reflected in words and stories; and 2) evaluate local understanding of the carbon footprint concept.

This study weaves together research on and knowledge of Haida governance, laws, and education within the urgent context of climate change and ongoing colonization. It is premised on one personal and pivotal goal: How can we make a difference? In recent years, I have observed concerning impacts from human-caused climate change. Snowfall has decreased or melted earlier each year, and summers are dominated by hotter temperatures, impacting our rivers and forests, as well as the occupants of these ecosystems. The ocean, our main source for food, is under threat from warmer temperatures, overharvesting, the arrival of invasive species, and the return of extirpated mammals, such as sea otters. The impacts of climate change are severe and sometimes feel irreversible.

I write most of this work in the first person. I am a mother, grandmother, great grandmother, aunt, cousin, and k'uuljaad Xaayda (*Haida matriarch*) of the St'awaas Xaaydagaay (*Sawhet Owl People/Eagle Clan*) of HIKinul Kaahlil (Cumshewa Inlet). Of my 78 years, I have only lived 17 years away from my home islands of Xaayda Gwaay.yaay (Haida Gwaii, known as Queen Charlotte Islands between 1787 and 2010), five of which were to complete my master's degree, from 2014 to 2019.

The Haida Nation is sovereign and has never surrendered our rights and title to our home. When I refer to “national” in my writing, I am referring to the Haida Nation. When referring to the colonial state, I speak of Canada or the federal or provincial governments.

Xaayda kil [Haida Language]

Like many Indigenous languages, Xaayda kil (*Southern Dialect*) and Xaad kil (*Northern Dialect*) were disrupted by colonial education. Today, we are actively pursuing a revival of both dialects through mentor–mentee projects, stories, songs, dances, and language immersion. One avenue for learning is the Skidegate Haida Immersion Program (SHIP). The elders attend each weekday and concentrate on recording, explaining/teaching, and revitalizing Xaayda kil. Throughout my research, Xaayda kil is included as much as possible to honour the knowledge carried in the words. Xaayda kil is an isolate, with no connection to any other language in the world. All Haida language included in this research is in Xaayda kil, except for northern place names, which are in Xaad kil.

Since the SHIP was first formed in 1998, elders have been working continually, gathering and recording knowledge while developing the orthography to better reflect the sounds that resonate in our language. At first the elders, fluent in our mother tongue and English, struggled to resolve why many spoke the words or phrases with slight variations even when they were being used in the same context. After discussions and looking at where their mothers originated from, they realized that there are many distinct dialects. They concluded that, due to the many years of being isolated from each other, just as our language is an isolate, the dialects evolved from the same isolation. With Kilgudang (*arranged*

marriages) and other legal functions, such as 'waahlGahl (*the final step in making an action or intellectual property legal*) and 'Waahlin (*an apology feast*), the language's foundation stayed the same, but its details varied. The elders' conclusion challenges what the people were led to believe from yaatsXaaydaGa (*Iron men's*) writings. The present population of HIGaagilda Llnagaay and Gaau originally lived in the ancient villages on all the coasts of Xaayda Gwaay.yaay. This explanation makes sense. Our ancestors have occupied our homeland since it was light then, and yet dark (Swanton, 1905a).

The published glossary and various recordings of words, phrases, and meanings show that Xaayda kil has developed through lived and observed experiences on the lands and the waters. The knowledge of harvesting cycles has resulted in a natural calendar that is inherently connected to this place.

The old ones with an ancient knowledge understood the multi-levels of knowledge buried in specific words and phrases in Xaayda kil and Xaad kil. In my father's last years, he would attempt to explain to me about the deeper meanings behind a phrase in Xaayda kil. The idea wasn't just the words that were spoken but the knowledge that was triggered when these certain phrases were said and acknowledged, and certain actions taken by the people of the village. An example of this is sk'awGan Gaalang skaasda, a phrase that describes the time when the colour of salmonberries changes from green to red or golden, a transformation that happens overnight. This change indicates that it is time to get ready to go to the west coast to catch spring salmon passing through our waters. The meanings behind the words spoken bring a vision of salmon swimming at night and the phosphorescent light trail they leave behind them. This phrase indicates the connection between the land and the ocean happenings. Another indicator connected to the salmonberries is earlier in the year: When the leaves and flowers first start unfurling/blooming, the halibut are in the inlet, but their flesh is blue. This means they need to eat to fatten up. When the blossoms become green berries, it means the halibut are plump enough to harvest. I wonder what other precious knowledge pieces have been lost because of forced disruption that prohibited the passing on of our language and life ways?

Personal Observations and Case Study

This research also draws on my personal observations about environmental changes in Skidegate. The world has shifted so significantly with a changing climate. We have adapted as we can, but now we are at a place where, even though we are resilient, it may not be enough. As Ocean people, our food sources have been impacted, especially in Xaana Kaahlii (Skidegate Inlet) where we live. It is critical to look at what is happening and how quickly it is happening to understand the urgency of changing our use of fossil fuels and decreasing our contributions to the global carbon footprint.

Xaayda (Ocean People)

We are Ocean people. Over the deep time when XaaydaGas Chii' akaatl' lxa (*Our ancestors first came out of the ocean*) to rest, Tllguuhlga Gan Xaayda Gwaay.yaay (*Had no place to rest as the world was covered with water*) (Swanton, 1905a, p. 110), the one with hair like a seagull, gave Nangkilslas two pieces of stone and told him how to put them into the water and occupy our lands; there were no trees available to build houses (Deans, 1895 Fedje & Mathewes, 2005). Other stories talked about our kuuniisii (*ancestors*) coming out of the waters and taking off their outer layer, just as one takes off their coat, only putting it back on to go back into the ocean to eat (GwaaGanad, personal communication, 2003). It was “light then, yet dark, they say” (Swanton, 1905a). In 1895, Deans published stories he gathered from our kuuniisii, telling how our physical human bodies have changed from walking on fours to finally being upright.

Prior to foreign epidemics, our population has been estimated to be more than 25,000. Foreign diseases brought from abroad severely impacted our population starting in the 1400s (Boyd, 1999; Gibson, 1992). Colonization has also impacted our lands, people, and governance.

DaaGang.nga (Expression When Things Are Really Bad)

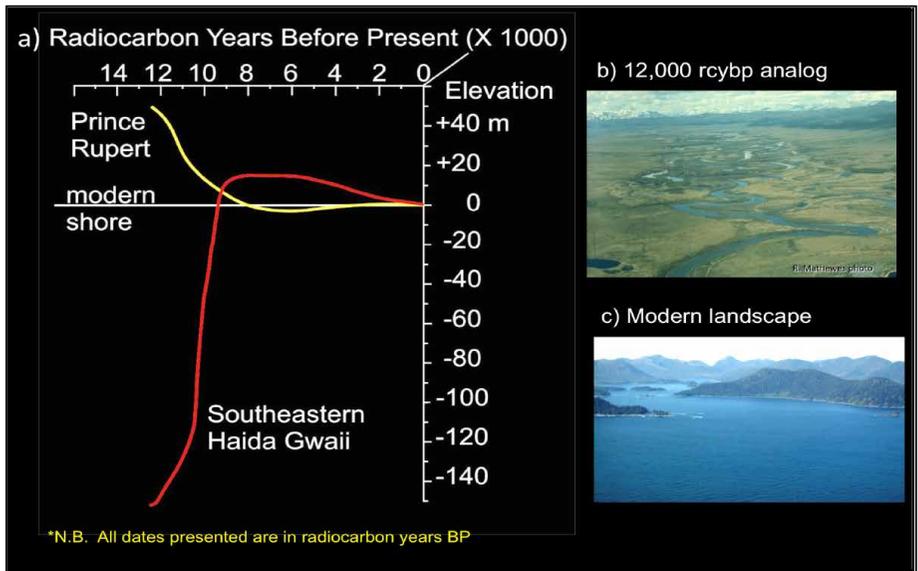
We have survived through a multitude of climate changes over thousands of years. Our stories tell us of floods, ice ages, droughts, and warmer weather. In “Haida Gwaii Human History and Environment from the Time of Loon to the Time of the Iron People,” Fedje and Mathewes (2005) described a time almost seventeen thousand calibrated years ago when the waters were lower by 140 +/- metres and then started to rise (Figure 1). The waters changed drastically and reached nearly 20 metres above the shoreline that is known today. These changes happened in a relatively short period of time, and Haida stories, as well as scientific accounts, describe these changes and how our kuuniisii adapted.

Deans (1895) recorded stories of our kuuniisii on Xaayda Gwaay.yaay in the 1800s. These stories describe a time when the weather was much warmer but was starting to get much colder (see also Deans, 1895, as cited in Fedje & Mathewes, 2005, p. 126, and Wilson, 2005). Other stories gathered by Deans (1895) speak of another time when the climate was much warmer and the insects were bigger and their bites killed the people. The ancestors used caves in rocks as shelters. Historically, they also dug holes in the soil and covered themselves with branches or skins (Deans, 1895), and the lands were similar to the steppes found in the northern areas of the world (Mackie & Acheson, 2005; Fedje & Mathewes, 2005).

Another story gathered by Deans (1895) talks about Kalga Jaad (*Ice Woman*) leading our people away from tllgaay 'waadluXan kalga gan (*the earth was frozen*) or 'waadsGwa / 'waadswa GaaGwii un kwaan gang (*Ice Age—lost way over there*)

in a time period before and up to the last Ice Age) as the people descended on our lands. Fedje et al. (2005) described findings in the intertidal archaeological site of Kilgii Gwaii (also known as Ellen Island) from the time that the waters were rising. It appears that our ancestors may have been using skin shelters for camping, as this area was a camping site. My observations led me to hypothesize that wooden stakes had a specific use for a skin tent, which would have enabled the people to be mobile ahead of the rising ocean and still have shelter. This could verify that in deep time humans existed on these Islands and the resilience of our ancestors (Fedje et al., 2005).

In the late 1800s, the people from the southern villages who survived smallpox and other diseases gradually gravitated to HIGaagilda Llnagaay because of the religious organizations promising they would be saved. Understanding that our id kunGasda ga xaaynang.ngas (*those living before us*) had experienced or heard of deaths of many hundreds and thousands of our relatives from as early as the 1500s, and definitely during the 1700s and 1800s, it would make sense that the survivors would be looking for a way to be saved. My family was the last group to move from our village of HIKinul Llnagaay (Cumshewa Village) into HIGaagilda Llnagaay.



Note. Change in sea level rise and topography of Haida Gwaii that is included in the story of Raven, shown here with the following: (a) radiocarbon dating; (b) photos of what Haida Gwaii probably looked like; and (c) photos of what it currently looks like. Reprinted with permission from *Haida Gwaii Human History and Environment from the Time of Loon to the Time of the Iron People* (Fedje & Mathewes, 2005).

Figure 1, Change in Sea Level Rise and Topography of Haida Gwaii

Families holding personal knowledge and inheriting responsibilities for certain lands and a portion of the ocean around their own villages (Elders of Skidegate and the Skidegate Haida Immersion Program [SHIP], 2016, p. 168) made serious decisions when moving to this village because it meant that they had to *k'uusGaw*. This meant families giving up power and living under the Hereditary leader of the village they moved to.

This decision to move from our original villages facilitated the imposition of new colonial laws, such as the *Indian Act*, *Fisheries Act*, and potlatch ban, without our consent. These laws drove our own laws underground. My *xaadGa* (father), Niis Wes of *Gakyals KiiGawaay* (*those born at Gakyals*), along with the *kuuniisii* of the St'awaas *XaaydaGaay*, tell me that because keeping our word was important for upholding our oral laws, they worked very diligently to live by the new laws put on them. As Alfred Adams said, "Without any treaty; without being conquered; we have quietly submitted to any laws made for our government, and this we intend to be our course" (Haida Laas, 2010, p. 7). When deciding to move into another clan's territory, protocol would require negotiations for food, fibre, medicines, and spiritual needs, as well as payment to the head 'Laana AwGa.

Huu tllguu hll 'waa gan (Methodology)

Xaayda kil yahdas gidGang 'la kilGuhlga dii huu tllguu hll 'waa gan (Haida law told me how to do it).

The *Xaayda kil yahdas* I use in this paper is Ad kyanang *kunGasda* (*to ask first*). One cannot presume that it is alright to do something, whether it is doing something to another or going on to another's territory, without getting permission first. Depending on what you wish to do, the type of payment must be settled between the stewards of the lands, waters, and spaces prior to any entry through bodies of water or land, or before any other actions, such as gathering for your needs. Prior to European laws being put upon us, *this* was the law everyone understood and lived by. It would have been settled with the 'Laana AwGa, or in the case of my proposed survey, with the village council or administration. In this spirit, discussions were necessary to ensure my proposal was grounded in relevant issues and that there was no misunderstanding in the questions for my proposed survey.

The underpinnings of my research are situated at the centre of Haida language, governance and laws, and life ways within the urgent context of climate change. I looked to *Xaayda Kil Yahdas* to guide my research and process. In my literature review and research, I asked, what can we do to lower our carbon footprint, provide safe and healthy homes, and make homes affordable? Throughout this article, I provide information, evidence, and research that suggest we look to the past—our old ways of doing things—o create a future that we want. As I outlined above, my *id kunGasda ga xaaynang.ngas* (*those living*

before us) were resilient and found unique and ingenious solutions to address environmental changes. I believe that we can (and must!) do this again.

ChinGaang Ad kyanang kunGasda (Seeking Consent and Witness)

Reflecting on the United Nations Declaration on the Rights of Indigenous People (UNDRIP, 2007 and the requirement to have free, prior, and informed consent, and previous research amongst the Haida, my need for consultation with my community, started prior to writing the research goals. Keeping this in mind, it was necessary for me to include consultation with Skidegate administrative staff before the research began. Prior to settling on the final version of my questionnaire, I approached the Skidegate village administration to discuss the intention and content of my proposed questionnaire. Discussions were necessary to ensure my proposal was grounded in the reality of daily issues and the general feelings among Skidegate residents about surveys. The Skidegate Chief Administrator, Barbara Stevens, and one of her staff, Dana Moraes, met with me. Discussion took place about the kind of information I wanted to gather. Did I want to visit each home, or could this be better accommodated by a workshop setting? How would I ensure privacy? Terminology was discussed and opinions on whether this or that would offend someone was challenged and resolved. At this point, never having conducted a survey myself, the questionnaire consisted of 101 questions, and there are approximately 360 homes in the village. My intention was to sample 10% of all homes in HIGaagilda Lnagaay. Simon Fraser University's (SFU) Office of Research Ethics (ORE) required completely unbiased questions, but I felt it was necessary to look at possible reactions of the community members in light of past negative experiences with other surveys and researchers (Borrows, 2010). For people who have lived in reserves and have been viewed as species to be studied and exploited, research has left a distaste in our mouths. Keeping this in mind, using respectful, unfettered English, and providing information which explained the purpose and hoped-for results needed to be planned as part of the process. A lesson in our laws from my father is to always daw in (*to have witnesses to validate my actions*). For this questionnaire and following Xaayda Kil Yahdas (Spoken Haida Law), I opted for a workshop instead of door-to-door interviews.

The aim of my questions was to understand the community's level of knowledge about climate change. I was also looking for thoughts about possible options for making our carbon footprint smaller. The community workshop also provided information on the quickly changing climate. Throughout, I kept Xaayda Kil Yahdas as my guiding values. Gudgii t'aalang giida (*we all share*) in light of the grant funding and educational opportunities I have been honoured to receive, I now share and will continue to share my learnings and my research results.

In this case, for my survey, I practiced Gud gad iis (*coming together to discuss*) and Aagang.Guu (*consensus*). I ensured that everyone taking part in answering

my questionnaire heard the same questions at the same time, including an explanation of what each question meant if they needed clarification. The people in attendance were ChinGaang (*invited to witness*) as well as take part in my research. When a Kilslaay attends a 'WaahlGahl (*potlatch*), they are invited as witnesses for the proceedings of the opposite clan's business. Kilslaay understand that they are there as witnesses to ensure everything is done legally as the host has discussed with their clans and the witnesses prior to the potlatch. What is to be witnessed needs to be understood and agreed upon prior to the potlatch. Once the issue has been brought to the legal conclusion, it is the responsibility of witnesses to keep the record straight and carry the message of what was legalized and/or tll yahda (*made right*). Once tll yahda has been completed, the issue is finished. No one can bring it up again.

HIᑭang.gulxaay.yang Guudluu (Work All Together)

As I have begun to describe above, in June 2017, I held a workshop in HIᑭaagilda Llnagaay, with the agreement and permission of 25 Elders, adults, and youth, to assess Skidegate residents' level of knowledge about climate change and to provide up-to-date information on housing, energy, transportation, funding, and food security in light of climate change impacts on XaaydaGa Gwaay.yaay. We gathered in the Skidegate Community Hall. The afternoon included storytelling, discussions, listening, sharing ideas, eating together, and gathering our learnings. A written questionnaire was distributed. The responses are reflected in my data for this research. The situation called for a sense of humour, and this was displayed throughout the session by the principle investigator (PI) and participants. Humour, consensus, reciprocity, and building resilience are important parts of how our ancestors worked to find good decisions.

The start of the workshop was over the lunch hour. A full meal was laid out for the participants and served prior to the actual work of the survey and presentations. This was done for two reasons. First, Haida protocol requires any work accomplished to be accompanied by the sharing of a meal, showing agreement, and having witnesses in attendance. Second, some of the persons attending may have had health reasons for needing to eat at regular intervals. I wanted to be respectful of that. Once lunch was completed, the workshop opened with introductions of all participants and volunteers to each other. Tickets to draw door prizes were given to each participant. Haida protocol requires that I honour people by giving something in return for what it is they have given to me or witnessed. Refreshments were available throughout the entire workshop. Although the Office of Research and Ethics at SFU instructed that no monetary payments be made, Xaayda kil yahdas also governs my actions. Before and during the workshop, tickets for door prizes were drawn. The order of doing business or making something legal usually happens first in the Haida way. Once completed, a meal is served. When all are in gina waadluxan gud 'laa

(*agreement*), the business is concluded. Instead of the usual order of business according to the Haida way, we did it this other way, with the meal first, and everyone was satisfied with the process.

During the workshop, I guided the people through each section of the questionnaire by reading the questions and giving participants sufficient time to record their answers on the hard copies of the questionnaire. Two presentations were given, discussions and explanations were provided when needed, and answers to the questions asked by participants were given. Volunteers were situated in areas where they could hear and record any questions.

Large poster-size papers were used to display the questions that I had permission from SFU's Office of Research Ethics to ask. Explanations were made when required.

After the conclusion of the initial workshop, an opportunity was provided through Swiilawiid Sustainability Society to speak on climate change and discuss options for making a difference in our world. Additional workshops took place in HIGaagilda Llnagaay and Gaw Tlagee (Masset) in 2017. No questionnaires were distributed at these sessions, but these gatherings provided another opportunity for youth and other community members to learn about local climate impacts and discuss options to address climate change. In this initial workshop and two other workshops, I was invited to present information on climate change and discuss options to make our carbon footprint smaller. The two latter workshops were held over two days. The first one was for all island women in Port Clements, and the other was co-hosted by Swiilawiid and the Council of the Haida Nation. Both focused on climate change and energy options for all island residents. Since these workshops, people have been anxious to start finding options to address climate change that will work for our communities and individuals. The Council of Haida Nation has one person to look at options; as an elected member of the Council, I sit in this committee as part of my portfolio.

Questionnaire

The questionnaire I provided in the initial workshop consisted of 13 open-ended questions. The list of questions was approved by the Skidegate Band Council and the SFU ORE. In March 2019, ORE extended approval until my thesis defence in April 2019.

Data Analysis

I summarized and synthesized the results from each question both quantitatively and qualitatively. I transcribed the answers provided by each respondent and synthesized the results by broad themes.

Educational Presentations

During the workshop, the first presentation was accompanied with a PowerPoint presentation which showed the various changes that are taking place on XaaydaGa Gwaay.yaay. This presentation showcased the rising waters, erosion caused by bigger storms, and the fluctuating weather extremes of drought in the summers and wilder rainy seasons throughout the year. The second presentation addressed the challenge of “Food Security Amidst Climate Change.” Anne Salomon, one of my advisors, presented this on my behalf.

Gangxaaw ad DuuGa (People Working Together and Results)

Participant Demographics

The workshop participants consisted of 18 women, six men and one gender unidentified. Participant ages ranged from 18 to 97 years old. Most of the 25 people present were between 58 and 67 years old. Most of the participants were bilingual, in Xaayda Kil and English, and 5 participants were language teachers. I feel it is important to acknowledge this as the thinking and understanding of English did not always reflect the rich and varied knowledge these participants contributed through their knowledge of Xaayda Kil.

Carbon Footprint

A highly diverse array of suggestions for how to reduce the carbon footprints at the individual, community, and national level were offered during the workshop. Individually, people suggested their carbon footprint could be reduced by changing their lifestyle choices. For example, respondents identified such options as the following: reduce, reuse, and recycle products; make wiser purchasing choices; choose energy efficient ways to travel; and cut back on the amount of energy they use to heat and light their homes. In terms of the broader Haida community, it was suggested that people return to and reinvigorate traditional Haida life ways and laws, all of which relate to the wise, respectful, and collaborative use of the environment. Moreover, shared climate-related information, climate-wise purchasing decisions by larger organizations, and reduced industry in the forests and ocean were identified as important measures to decrease the carbon footprint of Skidegate and the Haida community collectively. At the Canadian level, it was identified that federal laws needed to change and include Traditional Laws.

Haida Words for Aspects of Climate Change

In my questionnaire, I asked participants to provide words that signified aspects of climate change. Respondents identified 21 Haida words and phrases that described short-term weather patterns, longer-term climatic conditions, and associated laws, observations, and fears (Table 1). Specifically, four of the noted phrases describe some Haida laws that underpin how Haida live with the earth and all its creatures. For example, Yah gid and tll yahda both reflect the need to take action to correct wrongdoings. Ad k'yaanang refers to the need for consent before any actions are settled. Gina 'Waddluxan Gud Kwaagid describes the knowledge that whatever we do to the world we do to ourselves. While 10 of the 21 words identified describe various ephemeral aspects of weather, including words such as stormy, sunny, cold, hot, thunder, and rain, some respondents associated deeper interpretations and associated feelings with these words. For example, while daala means rain, the devastating impact of floods was associated with it. Similarly, while hlgahlguu means stormy, the respondent associated "danger on the sea and land" with this word. Finally, some phrases expressed people's feelings about climate change, including Dii 'Guudang.ngaay hlkuxiida ga 'Laana Gwaay', meaning "I am worried about the world."

Haida Words and Phrases	Respondents' Interpretation of the Meaning
Chiina gow Gaddii	<i>Less fish</i>
Daala	<i>Rain. The impact of rain can be devastating when it comes to flood.</i>
Dii Guudang.ngaay hlkuxiida ga 'Laana Gwaay	<i>I am worried about the world.</i>
Gaa.ywu	<i>When the water is so rough it looks smoky.</i>
Gina 'Waddluxan Gud Kwigid	<i>Everything depends on everything else.</i>
Hiilang	<i>Thunder</i>
Hlgahlguu	<i>Stormy. Wind. Means danger on the sea and land.</i>
K'iina	<i>Hot</i>
Taajuu	<i>Windy</i>
T'aaGaw	<i>Snow</i>
Taagaay wad.dluxan gow Gaddii	<i>Less food. (Traditional foods)</i>
Taajuu daahlgahlda	<i>Changing winds</i>
Xaay.ya	<i>Sunny</i>
Xwii	<i>Cold</i>

Table 1. Haida Words and Meanings for Aspects of Climate Change Identified by Respondents

Observations and Concerns of Climate Change

Observations and concerns about climate change spanned five broad categories with the following themes emerging from the data: extreme weather, rising sea level, warming, food security, and concerns about the next generation. Some citizens of Skidegate identified increased variation and severe weather conditions as a result of climate change, such as greater occurrence of storm ocean surges and higher velocity winds, longer winters and hotter summers, and drastic short-term changes that differ from normal weather patterns. Other villagers noted rising sea levels and potential impacts on coastal homes, erosion of beach areas, keeping up-to-date on climate issues, health of homes, and reduced habitat for all island's creatures, including humans, as points of concern with regard to climate change. Concerns were identified about increasing warming conditions and about the consequences of climate change on seafood availability and access. Specifically, it was felt some seafood will become increasingly scarce due to changing ocean conditions, and this will negatively affect people's health. As indicated, participants expressed concerns about how we impact our world and noted that they wanted to teach the important value of respect to the next generation.

Xal kaagingdal [Transportation or Moving Vessel]

Thirty-seven suggestions regarding transportation and solutions were identified in the workshop as options for combatting climate change. I grouped these into national governance policies, individual actions, and education. Governance suggestions included banning tankers close to Haida Gwaii, improving water transport, creating policies encouraging use of more efficient boats, running alternative energy sources, buying and operating our own ferry, and banning motorized boats from Xaana Kaathlii. Other governance suggestions included improving existing transit, initiating beach clean-ups, purchasing on-island value-added materials, and creating stronger policies on recycling. Individual transportation solutions included co-operatively buying a vehicle among families, reducing dependence on vehicles through human-powered vectors such as bikes and pedal boats for short travel, returning to canoes and sails, sharing transportation, and using rowboats for some activities. Nine people either had no additional suggestions or did not understand the question.

Guudang.ngaay uu 'waadsxagang, Tlaasgid [Additional Worries]

The villagers' additional concerns included the following: the need to work together as a community; education; energy; financial issues; governance; and values. Participants voiced the need to continue sharing Haida life ways, such as history lessons, teaching youth how to live off the land, and principles of Haida

stewardship. They also voiced the need to have respect for all living things, yourself, and elders, as well as the need to live more respectfully in the face of the changing climate.

There were ideas concerning energy, use of tidal or current wind power, housing, and accessing finances. Considering the history of logging and removal of other resources, the village people wanted to increase our Nation's governance including restricting the use of cedar and seafood to Haida only, closing all industrial resource extraction on the land, and protecting all waters, the title case, and rights to land. Transportation was an added issue as we are already paying for ferry services supplied by the quasi-provincial government. The idea of replacing the ferry with something more respectful than the current fossil fuel powered vessel was discussed. Looking at energy, it was suggested that there are other options to supply the village with respectful energy sources.

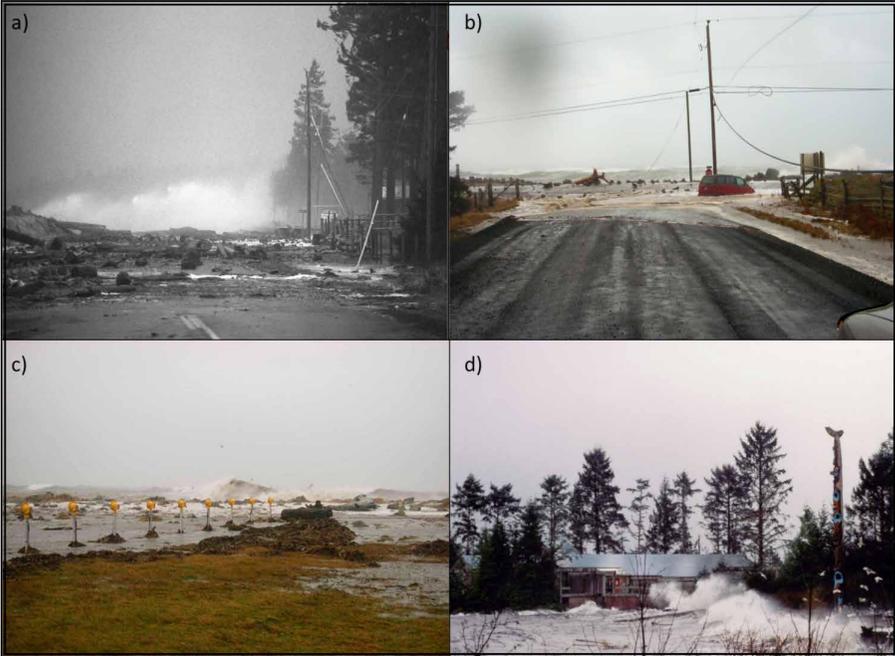
Sii.ngaay Gina daahlGahlda Giidang 'laa suu (Personal Observations of Climate Impacts)

As the ocean rises, the shoreline in front of HlGaagilda Lnagaay is changing. To protect the village, the area consisting of sand and cobble is covered by boulder berms, with portions consisting of concrete walls to withstand the bigger more frequent waves. Two creeks mark the extremities of the old village's footprint. The combination of bigger waves, larger freshets, and log impaction led to erosion that altered T'am Gandlaay to the point where it had to be diverted. The original bed was backfilled and built up, and a field was created. The area between the houses and the shoreline was used as a place where the village men stored their trolling boats in boathouses during the winter seasons. Below this is the area where once dii naanGalang k'aaw k'aaGada ad Xuud ts'isGalang (*my grandmothers*) dried herring roe on kelp and cooked seal in a pot.

The lack of snow in higher elevations results in lower water levels in the creeks. This prevents salmon from continuing up the creeks to spawn in these waterways—once thriving sources of food. The berries start reviving either earlier or later in the spring; the foods for mammals in the ocean either arrive at different times of the year or have moved north. This means the whales, both Grays and Humpbacks, must travel farther to find the foods they need. What will the overall effect be for the whales that travel here to eat every spring from Hawaii? Where will they go to find the once-abundant krill and other foods necessary for their survival? In the month of May, when we would ordinarily meet them in the Gwii Haanas East coast areas, they have either not come here or passed through earlier, in March or April. The change in temperature and ocean acidification threatens our food security.

As a young child and in the years between 1989 and the present, I have lived close to the land and seas. Roads to access our old village are rare. Many people no longer have a vessel and rarely go to our traditional territories/oceans.

I worked with Parks Canada for Gwaii Haanas and became familiar with the lands and waters of my ancestors. Over the years, the changes in the old village sites, the shorelines, and what was happening on the lands became obvious. I observed the changes each season. The impact of the big storm of December 24, 2003 (Figure 2) on the Haida Heritage/World Heritage Site of SGang Gwaay (*Wailing Island*) was obvious. Woody debris, Styrofoam, and plastics littered the lower terrace of the old village and the roots of the large spruce trees along the periphery were bare and battered.



Note. Yellowhead Highway at Tlell (a) and (b), Sandspit Airport (c), and Haida Gwaii museum at Kay Llnagaay (d). Photos used with permission from Jason Shafto, Michael Brown, Sandspit Airport Staff, and Mavis Mark.

Figure 2. Photos from 2003 Storm at Yellowhead Highway at Tlell, Sandspit Airport, and Haida Gwaii Museum at Kay Llnagaay

In 2014, winds reaching hurricane force touched down in Skidegate Inlet, tearing the roof off one house and whipping the waters of the inlet into spouts, moving from Skaama Llnagaay (*Alliford Bay area*) to what is locally known as Kaahl Guusda GuuhlGa Kun (*BC Tel point*) in mere seconds (S. Brown, 2017, personal communication). Brown sent me a few pictures showing the water action at Kaahl Guusda GuuhlGa Kun (Figure 3).

As I accompany sailing and powered vessels to the waters of Gwaii Haanas, I note that some ships' logs record these waters of the Hecate Strait as being much warmer. At TildaGaaw HIGaaga GawGa (*De la Beche*) in 2015, despite the fully running creek at the head of the bay, the water temperature was 18°C and very salty. In the open Hecate Strait, the ocean temperature was measured at 16°C.

With the drought conditions we have experienced each summer since 2015, our village council and maintenance have put us on water rations. The ancestors chose this site because the water availability was never an issue and the lake behind HIGaagilda provided a reliable source of fresh, clean, drinking water all year round. When I was a child, there were less than 200 residents, and now there are more than 900. This 80% growth is a result of changes to the *Indian Act* (Bill C-31) reinstating women and bringing them and their families home once more.

SGang Gwaay Lnagaay has been severely impacted, this time by GwiihlGihl (*hurricane force winds, or turning like a drill*) in December 2018. Trees, due to the shallow soil and lack of understory, toppled and damaged a large part of the forest adjacent to the old village. Erosion along the shoreline continues to happen as the tides and sea level rise.



Note. Photos with permission from Stacey Brown.

Figure 3. Photos of the Water Action at Kaahl Guusda GuuhlGa Kun in 2014, Showing Unusual Winds and Wave Action

KilGuuhlGa (Discussion or Talking it Over)

The information from workshop participants suggests that reducing the carbon footprint by the people living on Haida Gwaii (and those existing off/or extracting her resources) starts by transforming the current Canadian governance system. The first step is to understand the history of where the governance system came from and what impacts it has had on our people. In context of the *British North American Act*, and the *Indian Act*, I think now, that all those things, from the 1400s to the present, including climate change, are connected to these laws and the actions of capitalism. Once Canadian laws and their origins are understood, the next challenge is to look at the alternatives that could provide options and embrace respectful, inclusive, open, honest governance that treats all beings with respect and considers the long-term effects of climate change and other environmental losses. Given this, we may be able use our laws to reverse the effects of climate change so we can survive and thrive once more.

Kil ad Kil Yahdas (Law and Language)

Living in one place for thousands of years, our Nation has heard, learned, and practised kil yahdas, kil ad isda jii.nga (*and doing something for a long time*) as our kuuniisii did. The kil yahdas Gaal kingda (*showing around*) guided the kuniisii on how to live as 'laa guu ga kanhlln on this tllwaay (*canoe*) called Tllga AwGa (*Mother Earth*). These laws and ways of doing things, whether handing down an inheritance, gathering from the lands and oceans, building a house, or caring for each other, are the intricate threads woven into our life ways. The underpinnings of Haida kil yahdas are gud 'laa (*agree*), aasang.Guu (*doing something together*), ista ad isgid (*give and take or reciprocity*), and 'laa guu ga kanhlln, yahguudang.ngaay, yahk'ii (*speak truth*). They reside inside us and need to be reactivated and practised. Haida governance and laws have been disrupted by colonial efforts over the last few hundred years. We are resilient beings; re-activating and practising the old laws will be part of decolonizing as we acknowledge that the laws from across the seas do not work when examining the difference between capitalism and Haida kil yahdas. Gathering more for oneself has not worked; our laws tell us to only take what we need and to share. t

Our ancient systems still exist, and our modern government, the Council of the Haida Nation, works to safeguard the lands, waters, and people. Ancient stories tell us that we have a responsibility to live in balance on Xaayda Gwaay.yaay, including all our neighbours. The Haida Nation has initiated a title case in the courts to gain recognition of the rightful jurisdiction and rights to our Islands.

kihlgulas ad chii.a 'laa (speak truth and live with honour) is part of the way-of-living with all beings, whether animate or inanimate, whether living in the waters, on the lands, or in the skies; all beings deserve to be respected (Niis Wes, n.d., personal communication; George, 2018, personal communication).

The old laws are the foundation upon which our communities can strategize and design options to address climate change, offer relevant education, and accept the responsibility of making the world better for future generations.

Tllsda Gaagwii (*long, long time ago*; Wilson, 2005), this way of keeping balance by our kuuniisii was, and continues to be, an excellent building foundation for changes which need to happen. Ista ad isgid instructs that you must give something to keep free of obligations and honour the person or object that has given you something, whether it is food, fibre, medicine, or spiritual sustenance. I remember lessons taught to me when I was taken to Indian Residential School; my mom told me, never accept or take something from someone without tll yahda (*to make right*), meaning I needed to give something of equal value to the person who gave to me. I received information through the survey, and I have an obligation to honour those giving it by tll yahda. Along with honouring those who provided me with information, it is necessary to pass the way of doing things on to the younger generations.

Our laws are handed down to the younger generations through stories of past events and the consequences of ignoring them. A story gathered and recorded by Carter in 1977 called “The Vanished Oolichans” speaks of what happens when people take more than they need. In this story, Nang kilslas (*He who must be obeyed*) tells the ‘Laana AwGalang (*Town Chiefs*) the following:

You have been unwise in your treatment of the Oolichan River and have allowed your people to take more than you need, so this night as the moon rises, I will roll up the beautiful river and what remains of the little Oolichan and take it to the mainland. From this time on you and your people will have to go there and bargain for the little fish to make the oil because there will never be Oolichans in any river in the land of Haida Gwai [*sic*] again. (Carter, 1977 p. 44)

When reviewing the various words in Xaayda kil and thinking about how important it is for one to live their words, the old stories reflect the importance of yahguudang, such as gam kil daaGang.nga (*not bad speaking or making fun of other beings*) and generally yaanjahlilii xaanuu (*absolute truth*). In the stories gathered by Carter (1968), Deans (1895) and Swanton (1905a; 1908) from the Xaayda (*Haida*) living in Gaw Tlagee (*Old Massett*) and HlGaagilda Lnagaay examples are shown of what happens when we ignore these teachings.

In today’s world, we still use our old laws when dealing with various aspects of life. An example of this is found in *Raven Always Sets Things Right* (Frost, 2016), in which the writer recalls a potlatch held in 2016. During this event, the Yahgu Laanas/Yaghu Jaanas advised two of their House chiefs to apologize to their clan matriarchs and members for signing papers, using their positions to represent the proposed Enbridge Northern Gateway (ENG) pipeline. The ENG used a strategy of ‘divide and conquer’ to find people who would know individuals within the communities, hiring them to recruit the

weakest link with “standing.” What is it that this weakest link needed? The House chiefs were offered significant amounts of money that could be used to support our “culture.”

On August 4, 2015, the Haida Nation posted this along the proposed pipeline corridor:

The Council of the Haida Nation has posted a public notice in 12 community newspapers from Haida Gwaii to Williams Lake. The notice describes Enbridge’s latest campaign in communities and restates the nation’s position on the proposed project.

Our Nation is responding publicly to the tactics Enbridge is conducting behind closed doors in our communities,” stated kil tlaats ‘gaa. “Targeting individuals with a promise of ‘power and money’ is unethical and divisive, and our elected and hereditary leadership will continue to challenge these methods by speaking out and working with others to oppose this project.”

After waiting several months for the House chiefs to come forward and apologize to the clans and matriarchs, the clan hosted a potlatch to remove the two chiefs who had supported the ENG pipeline from their positions. People gathered to witness the proceedings in Gaw Tlagee. Witnesses came from Coastal nations as far away as California, as well as from the Haida Nation. The House chiefs’ act of using their position to represent an outside interest impacted more clans than just their own. Before the potlatch, the Haida Nation met, discussed the ENG pipeline, and collectively agreed that the protection of lands, waters, and food security are more important than any money the proponent could offer. This story is one example of the teaching, *yahk’ii kihlgulas (speak truth)*. The potlatch was about honouring a decision and about other clans saying to the Haida Nation, “we stand with you.” Using ancient laws, we keep balance in our clans, in ceremonies, and in the way we treat people. In our *kuuniisii’s* way, we always want to be above suspicion. Today, as in their time, it is important to live honestly and keep your word. If we fail in that, there will be repercussions.

Workshop participants in 2017 referred to various aspects where the ancient laws, such as treating all things with respect, responsibility, open discussion, truth, or living your words are applicable. In ancient times, if a person could not be trusted to tell the truth and be accountable, it meant banishment and, ultimately, death. Stories Swanton (1905a, 1905b, 1908) and Deans (1895) gathered from our *‘Laana AwGalang* remind us that we are to be held accountable for our actions when interacting with all beings. The importance of practising and upholding Haida law was reflected when participants expressed that they wanted to have the entire community involved in educating our people, reducing our carbon footprint, and positively impacting global climate change.

Everything needs to reflect our own laws. This has been the foundation of our living together and agreements with other nations for living respectfully and practising good stewardship of our territories (Brown & Brown, 2009).

This stewardship concept was brought to the world's view in 1985, when a dispute over unsustainable commercial logging eventually led to a peaceful confrontation through the Lyell Island Blockade. With the need to stop the desecration of our lands, rivers, and ocean, and with the obligation to wake up from our deep trance, the Haida Nation's stand against resource extraction and the support of people all over the world brought the federal government to the table for serious discussions. Although our Nation did not want a Parks Canada designation on the southern part of our homeland, protection was the goal. The ultimate solution was the Gwaii Haanas Agreement (<https://www.pc.gc.ca/en/pn-np/bc/gwaiihaanas/info/coop/amb>), signed in 1993 between the Haida Nation and the Federal Government. This Agreement established the first fully co-managed Heritage Site/National Park Reserve with Canada, and it includes equal management representation, which now involves the collaboration of three Haida representatives and three federal government representatives. They decide on operations, conservation, and planning for all parts of our southern lands and oceans, and they aim to preserve our culture in the context of Gwaii Haanas National Park Reserve and Haida Heritage Site (Gwaii Haanas Agreement, 1993). Today the area is expanded to include marine habitats: Gwaii Haanas National Park Reserve, National Marine Conservation Area, and Haida Heritage Site. Knowing exactly what you want, what you need, and what you already have, and being prepared to hold firm on what is important, are the important skills for obtaining the intended results.

Colonization, Climate Change, and Haida Lives

The great aim of our legislation has been to do away with the tribal system and assimilate the Indian people in all respects with the other inhabitants of the Dominion as speedily as they are fit to change. – John A. Macdonald, 1887, (as cited in Joseph, 2016)

Participants have lived under the shadow of colonial laws and legislation, yet they have held on to ancient teachings of how to be independent and respectful, and how to be caring family members and neighbours. Papal bulls issued by the Roman Catholic Church set the road for the Doctrine of Discovery, Terra Nullius, and the *British North America Act* (BNA Act, 1867). Widespread epidemics and deliberate relocation encouraged by churches severed the heritage carriers, our women, and prevented us from using our own laws. This imposed a patriarchal system on a matriarchal system. Specifically, the *Indian Act* separated women through laws that stated that when a woman married a man outside their band, they lost their ability to live in their community. In the Haida Nation, women carry the inheritance and the knowledge of genealogy, customs, and history.

The *Indian Act* required parents to send their children to residential schools or be sent to jail. In the residential schools, we were prohibited from speaking our own language, which was part of a planned assimilation. Crown laws prevented our continued control of territories managed through ‘Waahlgahl, kihl yahda Gan id tl’aa ijii (*potlatch is our legal system*).

The colonial *BNA Act*, which originated in Great Britain, continues to have sweeping impacts on chiiGa’ad ad Tllgaay Xaayda (*Haida lands and way of life*) as commented on by the following:

Most non-Aboriginal Canadians are aware of the fact that Indigenous peoples commonly regard land rights as culturally and religiously significant. Fewer non-Natives, I suspect, would consider their own connection with property in the same light; and fewer still would regard the legal foundation of all land rights in Canada as conspicuously theological. In fact, however, it is. The relationship between law and land in Canada can be traced to a set of fifteenth century theological assumptions that have found their way into both common law and the Canadian Constitution. These assumptions, collectively referred to as the Doctrine of Discovery, were initially formulated to mediate rivalries among European states vying for sovereignty rights in the New World. Although there were antecedents to the doctrine, it was Pope Alexander VI who applied them to the Atlantic World of the fifteenth century, in a two-part papal bull known as *Inter caetera*. The Doctrine of Discovery was the legal means by which Europeans claimed rights of sovereignty, property, and trade in regions they allegedly discovered during the age of expansion. These claims were made without consultation with the resident populations in these territories—the people to whom, by any sensible account, the land actually belonged. The Doctrine of Discovery is a critical component of historical relations between Europeans, their descendants, and Indigenous peoples; and it underlies their legal relationships to this day, having smoothly transitioned from Roman Catholic to international law. Upon discovery of a territory, the doctrine held that Indigenous peoples could not claim ownership of their land, but only rights of occupation and use. In this way, colonial powers claimed pre-emptive rights while conceding only restricted title to a territory’s owners. (Reid, 2010)

The Doctrine of Discovery philosophy has been used to separate the Xaayda from our ancient traditional territories (Reid, 2010). Most of the prize trees from our forests, fish in our waters, and minerals from our lands have been removed. The trees could have been an active part of keeping our carbon footprint smaller. Instead, laws designed to protect companies and stockholders ensure that the very things which could help us protect the world from rising oceans and hotter temperatures are being removed in the name of revenue.

As a result of the *British North American Act* of 1867, provincial and federal governments have developed legislation that permits them to hold, use, and develop all lands as a source of revenue for the Crown. Colonizing governments partitioned lands, which they gave away to encourage the settlement of “empty lands” that had once been actively used and managed by First Nations peoples (Figure 4). Examples of how these lands have been changed include the creation

As we look at the legal history of K 'aada Tllgaay (*North America*) and the various laws created from the *British North American Act* of 1867, these laws are grounded in the assertions of Terra Nullius and Doctrine of Discovery, gaining land and thereby wealth and power are the driving forces behind the laws that were brought or created by yaatsxaaydaGa when they came to our shores. Out of these laws came the *Indian Act* and guidelines for restricting our free movement around our traditional territories. Other guidelines denied clans ownership of our traditional territories and the traditional management of all sources of food. They also stripped us of the ability to care for our families. The idea of showing respect for all parts of our world while providing for our continued ability to gather provisions for food, housing, education, and transportation from the use of our forests and waters was not part of these laws.

Our supernatural ancestors created laws to control all our actions and prevent acts of disrespect. The old stories tell us that it was disrespect that caused foods or people to be taken away from us. Looking after each other and all other creatures in our domain is central to Haida law and absent from these other laws that were imposed. Canadian laws pertaining to Indigenous Peoples are adversarial, whereas Haida laws are built on principles of respect, reciprocity, and responsibility.

Governance: Using Haida Laws Today

Haida governance and laws have been disrupted by colonial efforts over the last few hundred years. Our ancient systems still exist, and our modern government, the Council of the Haida Nation, works to safeguard all the lands, waters, and people (Council of the Haida Nation, 2005). Our ancestors and the ancient stories tell us that we have a responsibility to live in balance on Xaayda Gwaay.yaay, including caring for the sky, waters, and all our neighbours. The Haida Nation has initiated a title case in the courts to gain recognition of the rightful jurisdiction and rights to our Islands.

Building an inclusive governance system or a system based on yahguudang dlljuu (*respectful acts*), xaaynang.nga kuuyada (*life values*), and sk'aadGa Gud ad is (*learning balance*), along with highlighting opportunities by which individuals and communities can reduce their carbon footprint, are the dominant themes that emerged from my research. All of these may require some aspect of decolonization and an infusion of Haida kil yahdas (*laws*) and xaaynang.nga kuuyada (*values*). Moreover, these ideas can be amplified and scaled up across Canada and will be applicable to other First nations. Canadian regulations, such as the *Indian Act*, *Species at Risk Act*, and *Fisheries Act*, hold Indigenous nations back and stop us from using our respectful, original laws.

The possibilities of an inclusive governance system would be to study the underpinnings of kil yahdas and principles brought forward by the supernatural beings. The major pillars of inclusive governments are gina 'waadluxan

xaaynang.ngas Gan yahguudang.ngaay ‘waagii kilxii gang ga (*respect every living thing*), yahk’ii kihlgulas honouring the words that we say to each other or living our words; ad ‘laa guu ga kanhlln (responsibility) that is part of privilege – returning to the principles. Our kuuniisii deserve to be able to say what it is that they need and the ‘Laana AwGalang and Kuuljaad to help each member of their clan and others as we see and meet their needs, whether that is physical, social, physiological or spiritual; tll yahda (make things right or balance) in all we say or our actions and sharing or looking after each other. Table 2 below shares some Haida words and their meanings for laws as identified by respondents.

Working together is part of looking after each other and is an oral insurance policy enabled by the principle of reciprocity (Troster, 2002). Reciprocity was a way of ensuring we looked after each other. It also guided us in our care as stewards of the lands and oceans. If we use Haida laws as our guiding principles (Figure 5), we are more likely to survive the uncertain weather oscillations and extremes of climate change.

Haida Words and Phrases	Respondents’ Interpretation of the Meaning
<i>Ad k’yaanang</i>	<i>To ask first. All acts must be done with consent.</i>
<i>Amass</i>	<i>A command to stop and restore balance.</i>
<i>Gina ‘Waddluxan Gud Kwigid</i>	<i>Everything depends on everything else.</i>
<i>K’aw kihl</i>	<i>The act of taking food home for the people to make sure they have enough.</i>
<i>Tll yahda</i>	<i>Making it right.</i>
<i>Yaahguudang</i>	<i>Respect.</i>
<i>Yah gid</i>	<i>Making it right.</i>

Table 2. Haida Words and Meanings for Laws Identified by Respondents

Governance: The Future

How long do we sit together under the thumb of the Federal government, knowing full well we are destined to remain wards of the Government if we do not choose to regain our power and independence? Choosing and preparing to move away from federal jurisdictions, such as the *Indian Act*, requires a firm plan in the areas of governance, including education, health, housing, conservation, monetary substitutes, revitalization of old fishing methods, and energy, to name a few. In this financially driven world, with vast areas of our trees already removed, survival and caring for each other require strong principles, good management, and forward thinking while we review and revitalize our ancestors’ laws and life ways. Imagine a world where each person matters and belongs.

Where does one start in the process of decolonizing government, Canadian laws, and us? A great place to start is by comparing the House of Commons and the Senate of the Canadian Parliament with ancient governance systems that reflect and use respect, transparency and inclusivity as their foundations. It is obvious the European laws imposed on K'aada Tllgaay and us are not working.

The principles of Terra Nullius, Doctrine of Discovery, and capitalism are based on taking without assuming the responsibility to care for the state of the lands, waters, and future generations. Look at the *Species at Risk Act* as an example of what prevents us from being responsible stewards. Consider what this type of thinking does to the future of coastal people. We need to replace laws that impede tried and proven ways of living with each other and all other organisms in our world. When we look at the origins of European laws and compare them with how our kuuniisii balanced their world, there are stark differences. Our laws and actions protect all life forms and ensure there is food and healthy lands and waters for future generations.

Coastal First Nations such as the Xaayda, the Heiltsuk, the Namgis, and the Nuuchahnulth are examples of Nations using the values and laws to care for people, lands, waters, and all other creatures that share their worlds (see Brown & Brown, 2009). Will this slow down, stop, or reverse the situation of climate change, the acidification of the air and the waters, the larger storms or droughts? As Borrows remarked,

Indigenous peoples' laws hold modern relevance for themselves and for others and can be developed through contemporary practices. While Indigenous legal traditions have ancient roots, they can also speak to the present and future needs of all Canadians. They should not be about, or even primarily about, the past. They contain guidance about how to live peacefully in the present world. They can be continually formulated to show us how to create stronger order. They can be constantly recast to teach us how to appropriately channel and cope with conflict. (Borrows, 2010)

Issues of Food Security

As mentioned by several of the workshop participants, commercialization, which has led to overharvesting, has made our ocean foods scarce. Our marine neighbours of the ocean world are overfished. The waters are polluted in many areas beyond use. These crises, along with the warming and acidification of all oceans, jeopardizes the foods we as Ocean people require to be healthy, thriving beings. The federal laws, such as the *Fisheries Act*, the *Oceans Act*, and provincial legislation, such as Conservation, Forestry, Fish and Wildlife, supposedly protect these same foods, but they do not always do so. As a result, they further impair our ability to maintain our health. This not only impacts us as Ocean people but also affects our neighbours, the whales, salmon, trees, birds, sea and land mammals, and other species throughout the food chain.

Upholding respect for all creatures means we would still be able to fish, gather shellfish, and use our native plants and trees for foods, medicines, and fibres. My father, Niis Wes, often told me that in the time of our ancestors and laws, if one person was hungry it meant everyone was hungry. Food, like other aspects of our life, was shared by all. When harvesting through “Terminal Fisheries” of salmon species, our elders and ancestors taught us to take the young, smaller, precocious fish because they did not contribute to healthy cyclical returns. The elders were taught that it is important to protect the larger, healthier salmon to allow them to continue their journey to spawn, thereby ensuring the strength of the cyclical returns. The way of harvesting halibut also followed the same principles: Leave the small ones for the next couple of years to ensure another fishery, and do not harvest the largest halibut as they are the breeders.

The Federal laws, such as *Species at Risk Act*, the *Ocean’s Act*, and the *Fisheries Act*, have all been designed to manage the various beings and creatures that are “protected.” However, these laws have had the opposite effect on First Nations people for many generations. The *Fisheries Act* has made it possible to overfish most species that we use as food but which are viewed by yaatsxaaydaGa as “resources.” Starting in the 1860s, the *Fisheries Act* was established in Canada and commercial fisheries were developed. In 1871, First Nations people were prevented from commercially fishing, which impacted prehistoric treaties and trade with neighbouring nations.

Before the 1920s, First Nations people were not allowed to hire lawyers to protect any part of our life, such as lands, life ways, foods, or title to traditional lands and waters (*Indian Act*, 1985). Federal and provincial laws have had the effect of causing poverty, denying access to healthy foods, preventing us from readily caring for those who require help, and preventing the ways of upholding old laws.

Our ancient laws helped protect the waters, lands, and the creatures. Today, the laws that were created as a result of Terra Nullius and Doctrine of Discovery have resulted in catastrophic impacts related to climate change, such as people dying from starvation, natural foods being eliminated, melting icecaps, acidification, and rising waters. With the laws of capitalism, it appears that we will keep going toward higher sea levels, more drastic storms and weather events, and less food for everyone. We need to revisit and readopt how the kuuniisii of traditional people looked after their lands and waters.

As we review the history and the responses given by the participants in my study, it becomes obvious that these laws put in place by the Canadian government have impeded our ancient ways. Before Canadian “management” of resources, First Nations ensured resilience through care and control of individual finfish runs. We stewarded stocks by taking only what we needed and leaving the largest and healthiest to reproduce. The decision-makers of today lack the connection to coastal ecosystems and management practices needed to prevent the continuation of our fisheries sliding into oblivion.

In the survey, participants expressed concern for food security, but the issues go further than just the actions of individuals. The participants want the village and Nation's councils to provide governance, which helps all children, elders and those who are without family to assist life ways of gathering from the lands and waters, as well as caring for homes. In stories gathered by Swanton (1908, pp. 400–407) from the people in Gaw and included as part of Haida Texts Masset Dialect is a narrative about T!ē and how as a result of the children making fun of a sea otter they had captured, two large waves came ashore and flooded the area. The stories further relate that the sea otter prevented the tide from falling to punish the people who would not share the mussels they gathered with the “Fat-One.”

One of the laws of our Nation is the responsibility we have to care for all “creatures” existing in our world. All creatures need to be protected or cared for using old methods. When federal agencies reduce First Nations’ access to healthy foods through their laws, the result is to subsequently reduce our resilience to other disturbances, such as climate change, acidification of the oceans, and pollution of drinking water. It is working together on common issues and realizing how important it is to secure and protect the natural world, the values included in our laws, and all other parts of Haida Gwaii that causes us to rise with a determination and enforce our resilience. When we look at the commercialization of the natural world, and then look at what is important to us as Haidas, it is easy to see why we can say “no” when we must choose between dollars and values. It is about looking after each other, caring for our world, and thinking about the generations that are coming behind us because we are responsible.

Conclusion

In the past, during my kuuniisii lifetime, paying attention and tracking the changes in the world through physical indicators, such as kelp, berries, and cloud formations, along with discussion and storytelling, allowed life adjust to the natural changes, as these happened slowly. The kuuniisii had the opportunity to adapt by moving to higher land as the water came up. They eventually adapted their homes from a hole in the ground to tents that enabled them to move as needed (Fedje et al., 2005). Now everything is turned upside down because change is happening so quickly. With ocean acidification, sea level rise, and extraction of all things that have been commodified for profit, the destruction of our lands, oceans, and all companions on this canoe called Tllgaay is sped up.

The world would be much better off if we could return to the old values of my ancestors and revitalize and reconstruct laws that would help us use respect, responsibility, consultation, and consensus—in other words, that

would help us work together. Instead of having elected Indian Affairs Chief and Council, we need to be looking at how we can re-establish and recognize hereditary leaders and clans as part of our legal and day-to-day management and stewardship.

The rising winds and waters and the related question of how to make changes in a timely manner are all parts of the puzzle of proper governance. Houses need to be built to withstand the winds and be set up for long-term occupation. Alternatively, given the suddenness in which rising seas can happen, houses may need to be portable. My overall vision and hope is that this article can be used to assist the various nations and villages to see what they can do for their residents when thinking about climate change. Above all ad 'laa guu ga kanhlln, yaahguudang and isda ad diigii isda are what I feel need to be remembered (Figure 5).



About Respect and Responsibility

... for all living things.

Knowing our place in the web of life.

Our fate runs parallel with the fate of the ocean, sky and forest people.

- Haida Land Use Vision (2005)

Note. Photos with permission from Jean Louis Martin and Haida Forestry.

Figure 5. Our Responsibilities to All Parts of Our World, Depicted In Photos

References

- Borrows, J. (2010). *Canada's Indigenous constitution*. University of Toronto Press.
- Boyd, R. (1999). *The coming of the spirit of pestilence: Introduced infectious diseases and population decline among Northwest Coast Indians, 1774-1874*. University of Washington Press.
- The British North America (BNA) Act, 1867*, SS 1867, c 3. <http://canlii.ca/t/l0zw>
- Brown, F., & Brown, Y. K. (Comp.). (2009). *Staying the course, staying alive: Coastal First Nations fundamental truths: Biodiversity, Stewardship and Sustainability*. Biodiversity BC. http://www.biodiversitybc.org/assets/Default/BBC_Staying_the_Course_Web.pdf
- Bush, E. J., Loder, J. W., James, T. S., Mortsch, L. D., & Cohen, S. J. (2014). An overview of Canada's changing climate. In F. J. Warren & D. S. Lemmen (Eds.), *Canada in a changing climate: Sector perspectives on impacts and adaptation* (pp. 23-64). Government of Canada.
- Carter, A. (1977). *This is Haida* (Vol. 2). Agency Press Ltd.
- Corak, M. (2018, August 21). Canada's official poverty line: What is it? How could it be better? *Economics for public policy*. Retrieved February 22, 2019, from <https://milesorak.com/2018/08/21/canadas-official-poverty-line-what-is-it-how-could-it-be-better/>
- Council of the Haida Nation. (2005). *Haida Gwaii Yah'guudang* [respecting Haida Gwaii]. Haida Land Use Vision. Retrieved March 23, 2019, from http://www.haidanation.ca/wp-content/uploads/2017/03/HLUV_lo_rez.pdf
- Indian Affairs 1913. (2010). *Journal of the Haida Nation*.
- Dalzell, K. E. (1989). *The Queen Charlotte Islands: Vol. 1. 1774-1966*. Harbour Publishing.
- Deans, J. (1895). The Hidery story of creation. *The American Antiquarian and Oriental Journal* (1880-1914), 17(2), 61-67.
- Elders of Skidegate and the Skidegate Haida Immersion Program. (2016). *HlGaagilda Xaayda Kil K'aalang. SHIP Xaayda Kil Glossary*. Published, translated and recorded by the elders of HlGaagilda Xaayda Kil Naay: Skidegate Haida Immersion Program.
- Fedje, D. W., Mackie, A. P., Wigen, R. J., Mackie, Q., & Lake, C. (2005). Kilgii Gwaay: An early maritime site in the south of Haida Gwaii. In D. W. Fedje & R. W. Mathewes (Eds.), *Haida Gwaii Human History and Environment from the Time of Loon to the Time of the Iron People* (pp. 187-203). UBC Press.
- Fedje, D. W., & Mathewes, R. W. (Eds.). (2005). *Haida Gwaii Human History and Environment from the Time of Loon to the Time of the Iron People*. UBC Press.
- Fisheries Act*, RSC 1985, c. F-14. <https://laws-lois.justice.gc.ca/eng/acts/f-14/>
- Frost, K. (2016, October 09). Raven always sets things right. *We Eat Fish*. <http://www.weeatfish.org/raven-always-sets-things-right/>
- Gibson, J. R. (1992). *Otter skins, Boston ships, and China goods: The Maritime Fur trade of the Northwest Coast, 1785-1841*. McGill-Queen's University Press. <https://doi.org/10.2307/j.ctt804t3>
- Gwaii Haanas Agreement, Canada-The Council of the Haida Nation, Jan. 30, 1993. <http://www.haidanation.ca/wp-content/uploads/2017/03/GwaiiHaanasAgreement.pdf>
- Haida Laas (2010). Indian Affairs 1913. *Journal of the Haida Nation*. https://www.haidanation.ca/wp-content/uploads/2017/01/jl_sept.01.pdf
- Henderson, W. B. (2006). Indian Act. *The Canadian Encyclopedia*. Retrieved March 13, 2019, from <https://www.thecanadianencyclopedia.ca/en/article/gradual-civilization-act>

- Indian Act*, RSC 1985, c 1-5. <http://canlii.ca/t/5333k>
- Jang, P. (2015, April 17) In Case you missed it, electricity rates just went up. *Times Colonist*. <https://www.timescolonist.com/opinion/in-case-you-missed-it-electricity-rates-just-went-up-1.2180018>
- Joseph, B. (2016). 10 Quotes John A. Macdonald made about First Nations. Retrieved from: <https://www.ictinc.ca/blog/10-quotes-john-a-macdonald-made-about-first-nations>
- Kolbert, E. (2015). *Field notes from a catastrophe: Man, nature, and climate change*. Bloomsbury Publishing.
- Mackey, T. K., & Strathdee, S. A. (2015). Big events and risks to global substance using populations: Unique threats and common challenges. *Substance Use and Misuse*, 50(7), 885-890. <https://doi.org/10.3109/10826084.2015.983008>
- Mackie, Q., & Acheson, S. (2005). The Graham Tradition In D. W. Fedje & R. W. Mathewes (Eds.), *Haida Gwaii Human History and Environment from the Time of Loon to the Time of the Iron People* (pp. 274-302). UBC Press.
- Reid, J. (2010). The Doctrine of Discovery and Canadian Law. *The Canadian Journal of Native Studies*, 30(2), 335-359. Retrieved March 13, 2019, from <http://www3.brandonu.ca/cjns/30.2/06reid.pdf>
- Swanton, J. R. (Comp.). (1905a). *Haida texts and myths: Skidegate dialect*. Washington Government Printing..
- Swanton, J. R. (1905b). *Memoirs of the American Museum of Natural History: Vol. 8, part 1. Contributions to the ethnology of the Haida*. E. J. Brill Ltd. (Reprinted from *Jesup North Pacific Expedition, Vol. 5, part 1.*)
- Swanton, J. R. (recorded by). (1908). *Memoir of the American Museum of Natural History: Vol. 10, part 2. Haida Texts – Masset Dialect*. E. J. Brill Ltd.
- Trosper, R. L. (2002). Northwest Coast Indigenous institutions that supported resilience and sustainability. *Ecological Economics* 41(2), 329–344. [https://doi.org/10.1016/S0921-8009\(02\)00041-1](https://doi.org/10.1016/S0921-8009(02)00041-1)
- United Nations. (2009). *State of the World's Indigenous Peoples* (Vol. 1). http://www.un.org/esa/socdev/unpfii/documents/SOWIP/en/SOWIP_web.pdf
- United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). (2007). (resolution 61/295), adopted 13 September 2007.
- Wilson, *Kii7iljuus* B. J., & Harris, H. (2005). Tllsda *Xaaydas K'aayang*.nga: Long, long ago Haida ancient stories. In D. W. Fedje & R. W. Mathewes (Eds.), *Haida Gwaii Human History and Environment from the Time of Loon to the Time of the Iron People* (pp. 121-139). UBC Press.
- Wilson-Smith, A. (2015). Aboriginal Peoples and the fight for the franchise. *The Canadian Encyclopedia*. Retrieved October 29, 2015, from <https://www.thecanadianencyclopedia.ca/en/article/aboriginal-peoples-and-the-fight-for-the-franchise>

Canoe as Teacher

Larry (Shucks) Nahanee, Chiaxten Wes Nahanee, Lilia Yumagulova, Kathleen Sperry & Jonathon Reynolds

Abstract

This article is about the Squamish Ocean Canoe Family and is based on stories shared by the Skwxwú7mesh Chiaxten (“Protocol Keeper”), Wes Nahanee, and the President of the Squamish Ocean Canoe Family, Larry (Shucks) Nahanee. The article tells the story of a revival of the Skwxwú7mesh ocean-going canoe and traditions, particularly through the annual Tribal Canoe Journeys. Through the stories, reflections, and teachings shared by Wes and Shucks, this paper looks at the “canoe as a teacher” and how Indigenous Pedagogies are attained through Canoe Journeys, particularly in the urban Indigenous context where this canoe resurgence means cultural continuity and healing.

Résumé

Le présent article porte sur la Squamish Ocean Canoe Family [Famille des canoteurs de mer de Squamish] et s’inspire des histoires racontées par Wes Nahanee, le Skwxwú7mesh Chiaxten ou « gardien du protocole », et Larry (Shucks) Nahanee, président de la Squamish Ocean Canoe Family. L’article raconte la renaissance du canot de mer et des traditions des Skwxwú7mesh, particulièrement des expéditions tribales annuelles en canot (Tribal Canoe Journeys). Grâce aux histoires, aux réflexions et aux enseignements transmis par Wes et Shucks, le présent article explore le rôle du « canot comme enseignant » et les expéditions en canot comme une occasion d’appliquer les modes d’enseignement traditionnels, particulièrement pour les Autochtones vivant en milieu urbain, où cette résurgence du canot est source de guérison et de continuité culturelle.

Keywords: Squamish Ocean Canoe Family, canoe, Indigenous Pedagogy, Tribal Canoe Journeys, cultural resurgence, cultural continuity.

Mots-clés : Squamish Ocean Canoe Family, canot, pédagogie autochtone, expéditions tribales en canot, Tribal Canoe Journeys, résurgence culturelle, continuité culturelle

Canoe as a Teacher

Canoe

C is for the creator who put us on this earth.

A is for our ancestors who helped us travel these waters and guide us.

N is for all nations to stand up and be proud of our heritage.

O is to find the opportunity to better ourselves and help others to be drug and alcohol free.

E is for the excitement of travelling on the waters, and meeting and greeting other canoe families.

And that's what canoe means to me.

- Frank Nahanee, used with permission.

The canoe has received much attention from Canadian scholars as a subject of canoe “nationalism”—a movement that adopted the canoe as a symbol of Canada’s settler colonial history (Dean, 2013). Some scholars have engaged with this topic in an effort to reconcile tensions between Canadians’ desired/perceived relationship with the land and waters and Indigenous sovereignties (past, present, and future) over these lands and waters (Dean, 2013; Grimwood, 2011; Peace, 2015). As Liz Newbery (2012) writes, since the concept of “wilderness is dependent on the displacement of Aboriginal people, canoe-tripping in wilderness spaces is not and can never be innocent or uncomplicated” (p. 42). Far fewer articles have directly conveyed the voices and the stories of Indigenous Peoples (Cole, 2002).

This article is about the Squamish Ocean Canoe Family and is based on the stories shared by the Skwxwú7mesh Chiaxten (“Protocol Keeper”), Wes Nahanee, and the President of the Squamish Ocean Canoe Family, Larry (Shucks) Nahanee. The article was primarily written by Lilia Yumagulova, a Bashkir researcher who is currently a visitor on the Sinixt lands, with assistance from Kathleen Sperry, a non-Indigenous researcher and archaeologist. This respectful phenomenological research approach was made possible through the relationships and connections made by Jonathon Reynolds, the Executive Director of International Sustainability Foundation who has worked with the Squamish Ocean Canoe Family over the years. The stories on which this article is based and the quotes that are used were shared through research interviews and relationship building events such as paddle carving workshops.

The Skwxwú7mesh People

Since time immemorial, the Skwxwú7mesh people have lived around the coastal inlet called Átl’ka7sem, Nexwnéwu7ts or Txwnéwu7ts, a body of water known today as Howe Sound. This coastal fjord in the Salish Sea cradles British Columbia’s (B.C.) most populous region of Metropolitan Vancouver from the north. Lying within the unceded territory of the Skwxwú7mesh Úxwumixw

(Squamish Nation), the Sound is home to “flourishing communities, and is a Traditional Knowledge hub, a biodiversity hotspot and a recreational playground” (Ocean Wise, 2020, p. 3).

For thousands of years prior to the arrival of European settlers, the Skwxwú7mesh traversed these waters in canoes through blue routes that connected village sites and campsites. The broader region, now known as the Georgia Strait, an arm of the Salish Sea, was once among the most densely populated corners of the land that is now known as Canada, with humming villages, harbours swarming with canoes, and valleys so packed with cook fires that they had smog (Hopper, 2017). The ocean was central to the Skwxwú7mesh way of life. It was a source of food, culture, ceremony, and spirit. Shucks Nahanee describes it:

The ocean was our highways. Hearing stories of ancestors about how they were young at the time, they used to walk over these mountains to get to Squamish, and they used to walk way far over that way to get towards New Westminster and hunting all the different game in here before Vancouver was even built. Always having that canoe, before the boats came, having that canoe to go up to Upper Squamish.

Colonization disrupted the Skwxwú7mesh way of life through diseases, land dispossession, and colonial systems of purposeful oppression. As described in Yumagulova (2020), a catastrophic smallpox plague in the late 1700s decimated the population in the region to small remnants, with deserted villages surrounded by “the skull, limbs, ribs and backbones [...] found in many places, promiscuously scattered about the beach in great numbers” (Glavin, 2014, p. 273). In the late 19th and early 20th centuries, as settlers colonized the lands and the waters, the Indigenous populations further dwindled, restricted to the reserves as “wards of the state and segregated from the mainstream of white society” (Harris, 1994, p. 617).

The 1876 Canadian *Indian Act* forced communities to settle in one reserve location, thus denying communities their traditional way of life (for example, using canoes to travel between winter and summer villages to accommodate seasonal foods). In 1877, under the *Indian Act*, the federal government placed some of the Skwxwú7mesh on the Kitsilano Indian Reserve no. 6 (or Señákw, the land on which the Vancouver Museum, the Planetarium, a Molson’s brewery, a housing complex, and Vanier Park sits today), the Mission Indian Reserve No. 1 (or Eslha7an, near what is now the Lonsdale Quay), and the Capilano Indian Reserve No. 5 (or Xwemelch’stn) (Sterritt, 2019).

Angella Sterritt, a journalist from the Gitxsan Nation, explains how an amendment to the *Indian Act* in 1911 made it legal to remove Indigenous people from reserves within an incorporated town or city without their consent. In 1913, the B.C. government forced the residents of Señákw to pack up and abandon their homes so the city of Vancouver could expand. Given only two days’ notice, they were put on a barge and sent over to the North Shore. The government burned down their homes and sheds (Sterritt, 2019).

After eight years of discussion, planning, and a legal agreement signed by the 16 Skwxwú7mesh Chiefs, the modern era of Skwxwú7mesh Úxwumixw (Squamish Nation) was declared on July 23, 1923 through the “Prayer of Amalgamation.” This document declared that “the traditional governance of the Skwxwú7mesh Úxwumixw, our People and lands, is still in place” (Squamish Nation, 2020, para. 3). Today, the Skwxwú7mesh *stelmexw* (Squamish People) continue to live in the area now known as the Lower Mainland of B.C., scattered among nine communities stretching from North Vancouver to the northern area of Howe Sound (Squamish Nation, 2020).

Canoe as a Spirit

The canoe is the “single most important physical manifestation of Northwest Coast culture [emphasis added]” (Simon Fraser University, n.d., para. 1).

The canoe connects the land and the ocean. It connects the past and the future of clans and communities through travel, trade, marriages, and other ceremonies. The shape of the canoe reflects the nature of the waters and the culture of the people. Wenstob (2015, p. 67) describes a great variance of the typologies of the canoes, each reflecting the needs and the waters of nearly every First Nation along the coast through its distinctive design. For example, the “Nootka” or “Chinook” canoe originated in the Nuu-chah-nulth nations and the Northern Style canoe is associated with the Haida nation. Other canoes include the Tsimshian river canoe, the Bella Coola river spoon canoe, the Coast Salish canoe, and the Salish shovelnose river canoe (Lincoln 1991 as cited in Wenstrob, 2015).

Situated at the nexus between technology and living beings, the canoe is a spiritual vessel that garners great respect, and its beginnings go back to the story of Great Flood:

The hulls of the canoe are constructed of once-living trees that survived centuries and sustained the lives of innumerable birds, insects, mammals and other plants. [...] Blessed at each step of their transformation and hardened by the forces of fire and water, these canoes come to represent whole clans and communities. The canoe’s technology is older than time, but still perfectly fitting for people seeking to explore and know the ocean. The Northwest Coast canoe provides the maximum amount of boat for the minimum amount of material, and represents unity and teamwork, as well as strength and health (Simon Fraser University, n.d.).

According to Skwxwú7mesh oral histories, during the Great Flood, villages packed what they could into their canoes and paddled to the sacred mountain known as Ch’kay-Nch’kay (settlers call this Garibaldi Mountain). As the waters continued to rise, the Skwxwú7mesh climbed steadily up the mountain until, as Chelachatanat (2020) describes,

one day they found themselves all packed up in their canoe, at the tip of Mount Ch'kay, anchored to the top. Nowhere else to hike to, no game in sight. No way of hunting game. They only had taken their fishing supplies because they knew the water would supply enough food for them. Then one day, the rain stopped. The sun was shining and all you could see was endless water and two peaks, plus hundreds of canoes tied together. (para. 12)

Text box: The canoe design reflected the waters and the uses for which they were built. The Coast Salish Canoe was primarily constructed for use in the sheltered waters known today as the Straits of Juan de Fuca, Puget Sound, the Gulf of Georgia, and the inlets and bays in Salish territory that do not have the large swells coming in off the Pacific Ocean. As the Bill Reid Centre webpage explains: “The gunwales of a Coast Salish Canoe terminate in a concave flare with the wood being only one finger-width at the edge, two finger-widths on the sides, and three finger-widths on the bottom. This Coast Salish Canoe, however, did not perform as well as others for raids, fishing and freight, so was gradually replaced in the early 1870’s by the West Coast Canoe through trade with the Nuu-Chah-Nulth. Eventually, the West Coast Canoe type even came to be produced by the Salish people themselves... The Salish also made a makeshift or emergency canoe from cedar bark, which was light and easy to portage, so was used to cross rivers or lakes.” (Simon Fraser University, n.d, para. 22)

For the Skwxwú7mesh, the canoe was the main form of transportation:

They used the canoes for clam digging and fishing out in the river and bringing our clams out in Vancouver. We had huge canoes. There were always canoes here. You always see pictures of the church here in North Vancouver with canoes always at the beach and the history of canoes on the water ways—that was their transportation (Dave Jacobs, a member of the Squamish Nation and retired Captain of the Canoe Club, as cited in Squamish Nation, 2020, para 22).

Colonization has had, and continues to have, a direct impact on the canoe. The ban on ceremonial *potlatch* (*Patshatl* in Chinook, an important cultural gathering which involved feasting, gifting, dancing, and exchange) expedited the assimilation of coastal nations into settler society (Cole & Chaikin, 1990). The canoe allowed mobility and access to food, and it carried the families to potlatches across the ocean. Although the building of canoes was not outright banned, building songs were prohibited where they could be (Taylor, 1980), and the banning of other integral cultural practices (e.g., potlatches) decreased the use of the canoe for traditional practices. By severing the connections to culture through the potlach ban, forcibly displacing people to small reserves, and instituting a pass system to control the movement of Indigenous people and prevent large gatherings, the spirit of the ocean-going canoe was a target of cultural genocide.

The canoe is a living physical manifestation of adaptation and resilience. Ritts et al. (2018) describe how, in the post-contact years, canoes (and the

appropriation of Indigenous Knowledges and labour) were “essential to the material and economic development of colonialism on the coast” (p. 11). The settlers depended on the dugout canoes for the marine fur trade. Additionally, government actors and resource developers “purchased canoe labor for various projects, including the mapping and surveying of territory” (p. 11). Cut off from traditional economies, First Nations also used canoes to travel great maritime distances to find waged employment in industries that required seasonal workers, such as the canneries (Ritts et al., 2018).

Over time, assimilation policies, land and water dispossession, and residential schools decreased the building and use of canoes; they also diminished the knowledge associated with these practices. Peterson et al. (2019) describe several reasons for the decline of canoe making: “the complexity of this skill (Lee et al., 2001), the lack of access to resources for making the canoes (de Paula et al. 2019), the influence of Western education (Brosi et al., 2007), and the discouragement faced by the youth when learning this practice (Németh, 2011)” (p. 59). Though Peterson et al. are not specifically describing the decline of canoe making in Skwxwú7mesh communities, some of these factors are relevant to the decrease in these lands as well.

It is important to note the type of canoe that survived these purposeful practices of cultural erasure, such as the racing canoe (compared to the compared to the nearly extinct but now revived ocean-going canoe). Rogers (2015) suggests that the racing canoes survived because they provided entertainment for settlers, who also saw them to be of sporting value:

Shared memory and documentation suggest that formal war canoe racing among the coastal Salish peoples began in the mid-1860s. The earliest recorded formal races were held in New Westminster (near contemporary Vancouver) in 1864 and were part of a larger political occasion organized by the governor of the colony on the occasion of Queen Victoria’s birthday. These gatherings became annual events, and as historian Keith Thor Carlson shows, the government quickly sought to transform them from political forums into largely entertainment venues. Anthropologist John Dewhirst notes that within the first few years after the initial 1864 races, the Salish war canoes “comprised only a few events” in the competitions, and suggests that the British watercraft races featuring sailing skiffs, rowing, and sculling longboats were the [principal] attractions of these “water sports.” Existing pictures and memories of these early war canoe races also establish that the canoes being used were traveling or cargo canoes: large, wide, stable crafts that sat two abreast and were neither the war canoes they were advertised as, nor built for racing. Although these early exhibitions and competitions only featured “war canoe” races as sideshow novelties, White organizers awarded prizes and money to the winning Indigenous pullers (Rogers, 2015, pp. 5–6).

For the Skwxwú7mesh, the pulling racing canoe has survived by being passed down through intergenerational family knowledge. Mike Billy, a member of the Squamish Nation, has been canoe pulling his entire life. In the early 1900s, Mike’s grandfather was the “go-to-guy” for a canoe in

Squamish: “He didn’t often paddle, because of his asthma and bronchitis, but he established himself as the Nation’s canoe carver” (Squamish Nation, 2020, para. 16). He passed the skill on to his son, Cedric Billy, who taught his own sons (including Mike). This intergenerational sharing of knowledge had been practiced since the sport began in the 1870s. Mike’s ancestral name, Lemxacha Siyam, “is seven generations old, and means canoe builder” (Squamish Nation, 2020, para. 21).

Canoe as a Teacher

The story of the revival of the Skw̓wú7mesh ocean-going canoe and traditions starts with the vision of Sáhplek̓ (Bob Baker). Sáhplek̓ lived in Hawai’i for over 10 years in the 1960s. During this time, he belonged to several outrigger clubs, raced on the canoes, and surfed. Shucks Nahanee describes the central role that Sáhplek̓ played in the ocean canoe revival:

When he came back home, he noticed that we only had racing canoes, we didn’t have our sea-going canoe. It was over 100 years the last time that there was ocean-going canoes in here.

Travel journeys was at its early stages in 1993; they were inviting canoes to come up to Bella Bella, so he really worked hard to get this canoe built.

They found a log up in Chilliwack Valley. They had band members interested to come out, so they started training for this. I think it took like six months for them to carve the canoe? The Master Carver at the time, he carved the canoe, but he never carved a sea-going canoe. You know, he’d never seen a sea-going canoe other than in museums and that, so that’s where he did his homework.

He went over to Victoria, went to the museum there, went to the library and got books, and then he met late Jerry Jones down in Tulalip Tribe. He was a designer/fabricator for Washington State Ferries, and he built the hulls for the ferries down there when he was younger. He helped Cedric Billy design, gave him pointers on how to make sea-going canoes because Jerry Jones was making sea-going canoes back then. (Shucks Nahanee)

The first canoe, called *Kxwu7lh*, was made between 1992 and 1993 and was carved by Cedric Billy from an old-growth tree that was approximately 700 years old. The second canoe was carved in 2005 and named *Hekili Manu*.

Sáhplek̓ (Bob Baker) continues to play a central role in canoe culture by training in the traditional dugout war canoes and the Great Sea-Going Canoes. He is a steersman for Tribal Canoe Journeys (an annual weeks-long paddle and gathering of Indigenous Nations that brings together thousands of participants) and the Pulling Together Journey (an 8- to 10-day journey that aims to empower youth and spark reconciliation between police, government public service agencies, and First Nations Communities).

Canoe as a Home for a Family

The canoe helped both Shucks and Wes to find their way home to their culture. Growing up, they had no connection to culture as their late mother, Leona, was a residential school survivor. Shucks shares how residential schools separated them from their culture:

We didn't get taught [culture] when we were younger, when we were kids. My mom was from residential school, so she didn't get taught that kind of stuff. I wasn't taught stuff like that. I had one uncle that used to bring me fishing, build a little boat out of a 2x4 and nails and stuff like that.

That's the only fishing I remember. My stepfather never brought me fishing; he had his sports buddies to go fishing, and by the time I hit my teens and I was just out on my own. I've been always doing stuff on my own and it's hard for me to see kids that are just given things and not work for it. (Shucks Nahanee)

Shucks didn't 'get out' of Grade 8; he started working at 16 and for the past 35 years, he has worked for the North Vancouver RCMP. It was late in life that Shucks found his way to the canoe:

I was 31 before I even got into a racing canoe. It was just like that's what I was supposed to be doing. There was no fear. I could paddle right away. ... When we went to canoe races, I wasn't encouraged by my parents to get in the canoe. We just played, we camped, and it was a big summer holiday for us. (Shucks Nahanee)

It was in the canoe that he was able to hug another human for the first time.

Wes was on a different path, and it was not until the community intervened by assigning him a new role that he found his way to the canoe:

I don't remember as a kid even wanting or knowing I was native. I knew we were "those Indians," but that's about it as a kid, as a teenager. I was the bad kid, the black sheep of the family. You either be a troublemaker, an alcoholic, or a druggie.

In '87 the family put me through ceremony, gave me the name Chiauxsten [which means "the one who looks after the laws and protocols of his people" in Skwxwú7mesh]. Threw a whole bunch of responsibility on me; didn't smarten me up right away.

And then in '93 I was asked if I would join in on the Tribal Journeys to Bella Bella. (Wes Nahanee)

It was in 1993 that the Squamish Nation Seagoing Society (now known as the Squamish Ocean Canoe Family) canoe took its maiden voyage to Bella Bella, B.C. Every year since, the members have been fundraising through raffles and bake sales, as well as by performing opening ceremonies at different venues in the Squamish Nation territories. The family has two

45-foot-long red cedar dugout canoes that were made on the reserve in North Vancouver. The Squamish Ocean Canoe Family Clubhouse is based out of the Mosquito Creek Marina.

The brothers, Wes and Shucks, describe the challenges of keeping the ocean canoe culture alive in a dense urban environment with limited access to the ocean:

I've seen a picture of canoes on the beach over here at our church. Like all of this land wasn't here before. ...the water used to come up to just about the church, across the tracks there. There were canoes on there. I said, "Someday I want to see that again." We have three canoes here now, three or four, in this area right here in our compound.

It's growing, like there's a family who moved up there now and Rick Harry has a family canoe; and Ray Natraoro has canoes. He's a master carver; he's the one that carved our *Kxwu7lh* Canoe. We talk about our ancestors and that but still we live in Vancouver, it's not like Nuu-chah-nulth where they have all that beauty out there.

I'd love to wake up and watch those rollers coming in, but we can't see anything. We can't even see the water here. We have one beach that is sand and rock, and that's down Ambleside in a park that's in our territory. (Wes Nahanee)

As Shucks shares, the Squamish Ocean Canoe Family Clubhouse is "for anyone inside or outside our Nation who wants to experience a drug, alcohol, and violence-free experience" (as cited in Mosquito Creek Marina & Boatyard, 2021, para 12).

Canoe as a Journey

To understand the true force of the return of the Skw̓xwú7mesh ocean-going canoe, it is important to situate it within the dramatic return of the canoe to the Pacific Northwest, which began in 1989, when Emmett Oliver (Quinault) organized the inaugural "Paddle to Seattle" event. In 1993, under the leadership of Frank Brown of the Heiltsuk Nation, the first annual *Qatuwas*, or "people gathering together" was hosted in Bella Bella, B.C. (NoiseCat, 2018). The movement unofficially started in 1986 when Frank Brown and nation members carved and paddled a traditional dugout canoe (*glwa* in Hailhzaqvl) from Bella Bella to Vancouver to celebrate their traditional mode of transportation at Expo 86: "This was the first time a *glwa* had been carved in the community for over one hundred years, and it represented the beginning of the Heiltsuk's cultural resurgence for many members of the Nation" (Marshall, 2011, p. 18). Since 1993, the weeks-long paddle and gathering has brought Canoe Families from different tribes and nations to the host community. Together, they share songs, dances, stories, and teachings. 2020 was the first year in which the gathering was cancelled, as a result of the global COVID-19 pandemic.

Every year since 1993 (except in 2020), the *Kxwu7lh* has participated in Tribal Journeys in the summer months, travelling to different host tribes and

bands within the Salish Seas, and paddling from as far north as Bella Coola in 2008 and as far south as Quinault (outside coast of Washington state) in 2002. All paddlers (known as Pullers) live a drug- and alcohol-free life and participate in sharing Squamish culture through traditional songs and dances.

Wes is a canoe skipper and cultural guide, as well as *Chiixten* (“Protocol Keeper”). He shares how the Canoe Journeys transformed his life by reconnecting him to his culture and the ocean and helping him find his way:

In '93 I was asked if I would join in on the Tribal Journeys to Bella Bella, and so ended up being selected for that crew and went. I met people from other nations, and sitting by the fire each night, they would share songs with us.

We didn't have many of our own songs, celebration songs out until '93 when we got our first Canoe, the Kxwulth, and that's when the first crew, we started our training and educating ourselves on our culture, as a lot of us didn't have that cultural aspect yet; we were still learning about other ways.

And then after a while, in '93 when we were on the Journey, a couple of them actually received songs as we were paddling to Bella Bella; just listening to the winds and everything. I have a couple of songs myself; a whole Rolodex of songs [laughs]. Powwow, Haida, Nisga'a, some Cree and Ojibway, some Lakota songs. It's just a passion for singing. (Wes Nahanee)

Song gifting has a deep cultural significance: “A song is considered the most treasured gift one can receive. Songs are usually passed down within families to the oldest son. [...] To receive a song is to receive great cultural wealth and gives a person high status in the community” (U'mista Cultural Society, 2021, para 18).

Shucks hopes that his son's life will be different—that language, songs, and protocol will be a part of his son's life growing up:

In 10 years, my son will be 19. I hope he's skipping the canoe. Even if it's not ours, he lives down in the States in Suquamish now, but I hope he has something to involve with our culture. I missed out on it as a kid. I didn't learn our songs until '98. I mean I was in the big house, like I'd know everybody else's songs, but our own songs, I didn't know those. I could just stand there with my drum and keep a beat and that was it. (Shucks Nahanee)

The Suquamish Tribe, in Washington State, is part of a collaborative project, the Healing of the Canoe, along with the Port Gamble S'Klallam Tribe and the Alcohol and Drug Abuse Institute at the University of Washington. These communities identified primary issues among youth, including the prevention of youth substance abuse and the need for a sense of cultural belonging and cultural revitalization. The Healing of the Canoe partnership aims to “address these issues through a community based, culturally grounded prevention and intervention life skills curriculum for tribal youth that builds on the strengths and resources in the community” (Healing of the Canoe Training Centre, 2021, para 3).

The story of canoe revival highlights the importance of canoes for the Skwxwú7mesh and broader Indigenous cultural revitalizations in the Pacific Northwest as “the material manifestations of the resilience of Indigenous nations” (Daehnke, 2019, p. 66). Nigel Lawrence of the Suquamish Tribe explains that, “as we learn about canoes and Tribal Journeys our community learns to pull together; the healing that the canoe brings to the community” (Healing of the Canoe, 2014, 3:07). For the Squamish Ocean Canoe Family, the canoe brought a culturally safe space for people to say ‘no’ to drugs and alcohol. This is an “intervention” method directly rooted in the canoe culture values of reciprocity, truth-telling, pride in culture, physical endurance, and achievement. The practice is also rooted in the sense of the canoe as family. For many Indigenous Peoples, including both Shucks and Wes, the canoe culture has been a healing journey.

Canoe as Pedagogy

This canoe resurgence represents a decolonized, active, and forward-looking vision of heritage, based in cultural values of place and reciprocity, and rooted in current and ongoing relationships and responsibilities (Daehnke, 2019, p. 66). These restored relationships are especially manifest in revived Canoe Families and Canoe Journeys. For example, in her research with the Heiltsuk, Beatie (2017) describes how the journeys transmitted what Frank Brown called “canoe teachings” or “life skills” that are very relevant to youth: how to work together as a team and not be selfish; how to communicate with others; how to work in the natural environment; how to plan and organize a large project like a journey; leadership skills (especially for canoe “skippers”); and the importance of discipline and perseverance (pp. 38–39). In referring to the Healing of the Canoe project, Nigel Lawrence of the Suquamish Tribe explains how the canoe “symbolizes and embodies Pacific Northwest Coast culture; the canoe is literally and figuratively carrying our teachings: how to pull together, the importance of balance, how to look out for one another, how to relate to other tribes and our surroundings” (2014, 1:17).

In a final example, Naadli Todd Lee Ormiston, from the Northern Tutchone (Tlingit), shares the teachings he received on a 55-day, 1,368 km canoe journey with his brother on the Eagle, Bell, Porcupine, and Yukon rivers (all part of his nation’s traditional territories) in the early 1990s. The teachings that he shares encompass preparation, the gift and power of silence, collaboration, trust, connection to animals, community linkages, the power of the land, and determination (Ormiston, 2019). The title of the article is part of an important teaching Ormiston received from a community member in Old Crow: Before setting out, the Elder said, “point your canoe downstream, keep your head up, listen to the land and paddle with a purpose!” (Ormiston, 2019, p. 47).

The Canoe Tribal Journeys are significant for supporting inter-nation learning and collaboration, and for the continuation and revitalization of protocols; however, Ormiston’s example illustrates how Canoe Journeys can

also be life-changing and provide valuable learning experiences when organized independently with close friends and/or family members. The teachings others receive through Canoe Journeys can also be applied to our daily lives and through Indigenous Pedagogies. Canoes are often used as metaphors for our life journey, such as in the title of an open professional learning series developed for staff across post-secondary institutions in B.C. called *Pulling Together: A Guide for Curriculum Developers* (Antoine et al., 2018). This document is discussed in the following section in relation to the canoe.

Indigenous Pedagogies

In this article, we have focused on the canoe as a vessel of intergenerational place-based learning. The Canoe as an Indigenous Pedagogy connects across space, time, cultures, waterways, and watersheds. This is important given how “our education systems struggle to connect with students’ lived experiences in ways that honor their home culture and engage in ways that are greater than the sum of their parts” (Hill et al., 2017, p. 13).

In this section, we discuss the canoe as an Indigenous Pedagogy. To structure this discussion, we refer to *Pulling Together: A Guide for Curriculum Developers* (Antoine et al., 2018), which was inspired by the annual gathering of ocean-going canoes through Tribal Journeys and is intended to support the systemic change occurring across post-secondary institutions through Indigenization, decolonization, and reconciliation: “Working toward our common visions, we move forward in sync, so we can continue to build and manifest strong, healthy communities with foundations rooted in our ancient ways” (Antoine et al., 2018, *artist statement*). In Section 2: Meaningful Integration of Indigenous Epistemologies and Pedagogies (p. 16), Antoine and colleagues list some key commonalities among Indigenous Pedagogical approaches, which include: personal and holistic, experiential, place-based learning, and intergenerational (Antoine et al., 2018, p. 17). We discuss how the “canoe as a teacher” relates to each of these themes or key commonalities, and include related canoe experiences, teachings, and reflections shared by Shucks and Wes Nahanee.

Identity and Healing: Personal and Holistic Learning

Gregory Cajete, a Tewa author and professor from Santa Clara Pueblo, New Mexico writes:

Tribal/Indigenous education is really endogenous education, in that it educates the inner self through enlivenment and illumination from one’s own being and the learning of key relationships. Therefore, the foundations for Tribal/Indigenous education naturally rest upon increasing awareness and development of innate human potentials. (Cajete, 1994, p. 34)

Indigenous Pedagogies focus on the development of a human being as a whole person. They promote self-awareness, emotional growth, social growth, and spiritual development. Unlike Western pedagogies that emphasize individual knowledge and compartmentalize subjects, holistic learning “engages the four knowledge domains that nourish holistic literacy and interweave all aspects of learning: emotional (heart), spiritual (spirit), cognitive (mind), and physical (body)” (Antoine et al., 2018, p. 19).

In addition to holistic learning referring to the self, holism refers at another level to the connections to, and relationships with, the community, other living things, the earth, and the spiritual (Morcom, 2017, p. 124). The learning that takes place on Canoe Journeys is holistic, encompassing the four knowledge domains. It fosters connections between people, communities, nations, the environment, and the spiritual. As discussed above, the Canoe Journey also provides a culturally safe setting and support system to release and heal from personal and intergenerational traumas and to (re)connect with identity. As reflected by Ormiston (2019), “this trip, for me personally, was about reconnecting with my identity and being able to find connection to people and places. You know, these connections were the most important thing to me” (p. 49). For both Shucks and Wes, this personal and holistic learning means *padding inward* to better understand one’s path and to find a way to their culture that was severed through the residential school for their mother Leona.

Experiential, Observation-Based Learning

Indigenous Pedagogies are experiential because they emphasize learning by doing. Historically, young people learned how to participate as adult members of their community by practising the tasks and skills they would need to perform as adults (Antoine et al., 2018). In a contemporary setting, an emphasis on experiential learning means a preference for learning through observation, action, reflection, and further action (Antoine et al., 2018). As explained by Marie Battiste from the Potlotek First Nation in Nova Scotia (who is also the founding Academic Director of the Aboriginal Education Research Centre at the University of Saskatchewan), the distinctive features of Indigenous Knowledge and Pedagogy are “learning by observation and doing, learning through authentic experiences and individualized instruction, and learning through enjoyment” (Battiste, 2002, p. 18). The following dialogue unfolded when Shucks and Wes were asked how they were passing some of this knowledge to the youth:

Shucks: I’m not a teacher-type. I don’t really have patience to do that kind of stuff.

Wes: Shucks is old school; he just does. He works on the canoe, does whatever has to be done.

Shucks: And if someone’s willing to come down and learn that way...

Wes: Then they can watch him, and they can learn. Myself, I was like that when I first started, but because I work in schools and all that now, I’ll take kids by the

hand. I'll show them stuff, but I usually tell them when I went fishing, hunting and stuff like that, my uncles never took us by the hand, they always just did. *If you're not paying attention, you're not learning.* That was kind of hard when I first started working in schools that I had to come up with agendas and work a certain way with them. Do a little bit more explaining as to what we're working on. (Shucks Nahanee & Wes Nahanee)

In the book, *The Great Canoes: Reviving a Northwest Coast Tradition*, David Neel (1995, p. 5 as cited in Wenstrob, 2015, p. 70), a member of the Fort Rupert Kwagiutl Nation, describes how the canoe carving site is not only a place where people can learn through observational learning, but also one that becomes “a meeting place as people gathered to watch the canoe take shape.” While canoe carving continues to be “an important social process that brings people and knowledge together” (Wenstrob, 2015, p. 70), the Canoe Journeys themselves are filled with opportunities for observational and experiential learning—from other people on the Journeys, as well as from other people, places, animals, landscapes, and waterscapes along the way.

Place-Based and Land-Based Learning

Indigenous Pedagogies connect learning to a specific place by situating the knowledge in relationship to a location, experience, and group of people. Shucks and Wes speak to the many difficulties related to maintaining this place-based learning in a large, densely populated metropolitan area with increasing marine traffic: “It’s really changed through here since ‘98 when I started doing this too, the traffic, the ships that are in and out of here is a lot more” (Wes Nahanee). It is also difficult to teach about culture when the traditional foods are not available: “I remember as a kid back in the late ‘60s where we could go get clams underneath the Second Narrows, and then just a few years later, it’s polluted in there because of the shipyards there” (Shucks Nahanee).

What is more, it is hard to teach about your canoe culture when your access to water is barricaded by settler shoreline development:

One of the biggest barriers that I know of is landing sites to take our canoes out and put them back in. We have our own here at the marina, but don’t want to burden them too much with that. And the marina next door they charge outrageous amounts of money just to put a canoe in. (Wes Nahanee)

Finally, it is challenging to paddle in an inlet that prohibits non-motorized traffic:

One barrier that used to come up was because we’re in the Port of Vancouver, between Lion’s Gate Bridge and Second Narrows, there’s supposed to be no un-motorized vessels allowed in the harbour.

Vancouver Ports used to pull up beside our canoes and tell us that we had to go back to the marina. I know Bob has done it and I've done it myself. I don't know if you've done it, but just waved at them. Me, I waved, I said, "You told my ancestors that, look what happened." I said, "I'm staying out here, have a good day." And they just kind of looked at you like okay, and they drive away. (Shucks Nahanee)

The best way to navigate these contested waters was through relationship building:

Since Vancouver City Police have their own canoe, their harbour patrol got a little more lenient with us out there. I guess that's all being one big happy family—you know they do that so if some of their members are out on those canoes then they understand what we're all about. (Wes Nahanee)

Despite the challenges, both Shucks and Wes are seeing signs of hope. For example, the animals are coming back:

Shucks: Just right here we have otters, we have skunks, racoons, deer...

Wes: Beaver.

Shucks: Beaver, falcons, red tail fox. Over in that biggest tree over there is the big eagle nest.

Wes: And the otter family, little red face. (Shucks Nahanee & Wes Nahanee)

The canoe crews take care of the coastal environment, clean up the floating garbage, and do ocean monitoring work. For example, water-quality measurements were made for the United States Geological Survey by towing water-quality sondes behind the canoes. They move slowly and steadily through the water at a pace that allows the collection of densely spaced data (Akin & Grossman, 2010). Canoes are ideal platforms for conducting surface-water-quality testing because they minimize disturbance and contamination of the water common with motorized boats.

Wes and Shucks also hope that others will contribute to ocean clean-up and ocean monitoring. When asked to share one teaching with Canadians about the ocean, Wes immediately said, "Pick up any garbage that you see when you're out on a vessel; whether it be a canoe, a boat, rubber tire, whatever it is. Yeah, it does a lot of good, just being respectful. You can still smell the salmon when they're swimming, which is hopeful" (Wes Nahanee).

As the above examples show, a canoe is a teacher that helps one to know the land and oneself: "The Canoe Journey teaches me that our everyday lives contain an archive that documents our philosophies, our laws, our customs, values, and practices. I learn that working on the land is a powerful site of pedagogical instruction and identity formation" (Ormiston, 2019, p. 46).

Cultural Continuity: Intergenerational Learning, Families, Relationships, Community

Elders and Knowledge Keepers are an integral part of lifelong learning. They teach responsibilities and relationships among family, community, and creation, and they reinforce intergenerational connections and identities (Yumagulova et al., 2020). Elders can help set goals for future generations (Williams & Snively, 2016). Intergenerational learning has been central to bringing back the canoe. The Indigenous canoe is thus not only a liaison between the land and water, but also a vessel of intergenerational learning between the youth, Elders, Knowledge Keepers, and culture. It facilitates a reciprocal relationship between the young paddlers and Indigenous traditions wherein each enriches the other (Marshall, 2011, p. 36). The Tribal Canoe Journeys speak to the power of intergenerational learning, which situates learning as a journey within the broader, more holistic and interconnected land- and water-based Indigenous Pedagogy (Charnley, 2019, p. 25).

In exploring the role of Tribal Journeys for the Kw'umut Lelum youth, Marshall (2011) finds four key theoretical constructs:

- (1) Tribal Journeys can be considered a modern-day rite of passage;
- (2) Relational interactions with people and places are integral to Tribal Journeys;
- (3) Traditions and teachings are communicated through journey interactions and actions; and
- (4) The *Great Canoe* is a “live” vessel that can connect people and Indigenous traditions. (pp. 84–85)

As Shucks and Wes's stories illustrate, Tribal Journeys are a modern-day opportunity for Indigenous adults in urban nations to connect with their own culture. Other Indigenous individuals and communities can also connect with their own culture through traditional canoe transportation and ceremony. The Journeys also create a time and space for the young people to connect with the Elders and the Knowledge Keepers—“to witness their knowledge, to learn from their teachings, and to hear their stories” (Marshall, 2011, p. 87). As Rowe et al. (2020) state, “the profoundly interrelational nature of Indigenous communities means that older adults' wellness depends on first reclaiming their cultural identity and then on their roles as intergenerational transmitters of knowledge” (p. 1). Tribal Canoe Journeys provide opportunities for reclaiming and sustaining cultural identities. They are a place for knowledge transmission within and between communities, as well as a space for healing and supporting individual and community well-being.

Canoe as Collaboration: Preparedness and Awareness

with respect to this canoe journey there will be extremes of weather and climate
there will be portages rapids waterfalls riptides swells crests gales typhoons tsunamis
forest and grass fires droughts sandstorms blizzards toxic sludge customs agents
so bring waterproof windproof heatproof coldproof insulated breathable comfortable
light wash 'n wear bedding clothing attitudes and a thick skin
you might want to bring a tent some bushsmarts and navigating know-how
but please no cellphones beepers laptops palmtops modems. (Cole, 2002, p. 447)

In the excerpt above, Peter Cole, a member of the Douglas First Nation who also has Celtic heritage and is an Associate Professor in Indigenous Education at the University of British Columbia, provides the readers with a “protocol for passengers” that are willing to begin a journey of aboriginalizing methodology (Cole, 2002). Canoe Journeys encourage people to think about the many risks involved in the Journey and plan accordingly in order to minimize risks, be vigilant, and mitigate any threats as they arise. This process may help people conceptualize larger existential risks, such as the climate crisis, and encourage them to learn more about these risks and take steps toward minimizing them. Canoe Journeys require preparation and awareness, skills which can also be more widely applied to our daily lives. Additionally, canoes have been used as rescue vessels in the face of flooding, tsunamis, and fires, such as in the story of the Great Flood and the Great Fire of Vancouver.

The canoe is also an exploration and a rescue vessel that continues to benefit colonizers. One of the most poignant expressions of this relationship is in a song shared by Wes called Sk'dnel Slulum, a haunting and powerful paddle song that “comes from a collaboration with the newcomers when they first came” (Wes Nahanee). In 1886, the Great Fire of Vancouver set ablaze the newly incorporated city and burned down over a thousand buildings. The fire and the people jumping into the dark, cold ocean waters were very visible from the Skwxwú7mes village [Slhá7aḥ] across the water from Vancouver. Wes explains:

At that time it was most of our *slanay*, most of our ladies, that were at the village because the men were working at the forts that were going up, Fort Vancouver, Fort Burrard, as well as various sawmills and our men, our *swi7ka*, were working at that time, so the ladies being the ones at the village across the water, started seeing people in need, trying to get away from the fire, and they jumped into their canoes and started paddling across to Vancouver from North Vancouver, picking up people and bringing them back to safety.

They sang Sk'dnel Slulum, a paddle song, because they had travelled all day long, back and forth, back and forth, picking people up. When they were going to Vancouver there was maybe two or three ladies in each canoe, but they would fill up the canoes and have help paddling back to the North Shore. One warrior woman, she had a little different ways, but she brought us teachings of coming together and being one and looking after each other. Through her work she brought the

community together to look after each other. My Nation was matriarchal before the newcomers came and changed us into a patriarchal society. So our grandmothers kind of stepped back and that's where some of our teachings got lost was because our ladies were put in the background. But I'm honoured to say they are coming forward now and stepping up and showing us men how to actually be a caregiver and a lifegiver. (Wes Nahanee)

Conclusion

This article is based on stories and songs shared by the *Skwxwú7mesh Chixsten* ("Protocol Keeper"), Wes Nahanee, and the President of the Squamish Ocean Canoe Family, Larry (Shucks) Nahanee. This is a story of loss, resilience, and resurgence. It is a story that lives on through songs and ceremony. It is a story that remains to be told with every stroke of the paddle as the canoes, the family, and the *Skwxwú7mesh Úxwumixw* live through the next millennia, connected to the blue routes of their ancestors.

This is also a story that offers lessons for settler educators. Canoe as a classroom and a teacher highlights the value of experiential learning and the importance of learning by observation. It emphasizes the usefulness of being mentored into your practice, especially through intergenerational learning. Finally, it underscores the significance of place-based and peoples-based learning. We hope that this article will encourage teachers to learn more about the land and the waters on which their classrooms are built and to reach out to local Indigenous Peoples to incorporate land- and water-based Indigenous Pedagogies into their practice. To conclude with the words of Chixsten Wes Nahanee, "The waterz have been rough but we must continue to move our canoe forward."

References

- Akin, S. K., & Grossman, E. E. (2010). *Coast Salish and U.S. Geological Survey 2009 tribal journey water quality project* (Open-File Report 2010-1143). U.S. Department of the Interior, U.S. Geological Survey. <http://pubs.usgs.gov/of/2010/1143/>
- Antoine, A., Mason, R., Mason, R., Palahicky, S. & Rodriguez de France, C. (2018). *Pulling Together: A Guide for Curriculum Developers*. BCcampus. <https://opentextbc.ca/indigenizationcurriculumdevelopers/>
- Battiste, M. (2002). *Indigenous knowledge and pedagogy in First Nations education: A literature review with recommendations*. National Working Group on Education. https://www.afn.ca/uploads/files/education/24._2002_oct_marie_battiste_indigenous_knowledgeandpedagogy_lit_review_for_min_working_group.pdf
- Beattie, H. (2017). *Resurgence of the ocean-going canoe: An exploration of the impacts of Tribal Canoe Journeys on the Heiltsuk Nation through participatory video* [Master's thesis, University of Manitoba]. <http://hdl.handle.net/1993/32865>

- Brosi, B. J., Balick, M. J., Wolkow, R., Lee, R., Kostka, M., Raynor, W., Gallen, R., Raynor, A., Raynor, P., & Ling, D. (2007). Cultural erosion and biodiversity: Canoe-making knowledge in Pohnpei, Micronesia. *Conservation Biology* 21(3), 875-879. As cited in Peterson, D., Hanazaki, N., & Li, F. (2019). Understanding canoe making as a process of preserving cultural heritage. *Ethnobiology Letters*, 10(1), 59-68.
- Cajete, G. (1994). *Look to the mountain: An ecology of indigenous education*. Kivaki Press.
- Charnley, K. (2019). *Embodying Indigenous Coast Salish education: Travelling with Xé: Is the sister. mapping Katzie/q'icay's stories and pedagogies* [Doctoral dissertation, University of British Columbia]. <https://doi.org/10.14288/1.0384575>
- Chelachatanat (2020, July 30). Opinion: Ch'Kay – Mount Garibaldi – a Squamish Nation tale. *Squamish Chief*. <https://www.squamishchief.com/opinion/opinion-chkay-mount-garibaldi-a-squamish-nation-tale-3351657>
- Cole, D., & Chaikin, I. (1990). *An iron hand upon the people: The law against the Potlatch on the Northwest Coast*. Douglas & McIntyre.
- Cole, P. (2002). Aboriginalizing methodology: Considering the canoe. *International Journal of Qualitative Studies in Education*, 15(4), 447-459. <https://doi.org/10.1080/09518390210145516>
- Daehnke, J. D. (2019). A Heritage of Reciprocity: Canoe Revitalization, Cultural Resilience, and the Power of Protocol. *The Public Historian*, 41(1), 64-77. <https://doi.org/10.1525/tph.2019.41.1.64>
- Dean, M. (2013). *Inheriting a canoe paddle: The canoe in discourses of English-Canadian nationalism*. University of Toronto Press.
- de Paula, L. L., Dechoum, M., Fonseca-Kruel, V. S., Tamaio, N., Hanazaki, N. (2019) Artisans and dugout canoes reveal pieces of Atlantic Forest history. *PLoS ONE* 14(6), Article e0219100. <https://doi.org/10.1371/journal.pone.0219100>. As cited in Peterson, D., Hanazaki, N., & Li, F. (2019). Understanding canoe making as a process of preserving cultural heritage. *Ethnobiology Letters*, 10(1), 59-68. <https://doi.org/10.14237/ebl.10.1.2019.1363>
- Glavin, T. (2014) The pre-contact era. In R. Beamish & G. McFarlane (Eds.), *The sea among us: The amazing Strait of Georgia* (pp. 263–279). Harbour Publishing.
- Grimwood, B. S. R. (2011). “Thinking outside the gunnells”: Considering natures and the moral terrains of recreational canoe travel. *Leisure/Loisir*, 35(1), 49-69. <https://doi.org/10.1080/14927713.2011.549196>
- Harris, S. (1994). “Soft” and “hard” domain theory for bicultural education in Indigenous groups. *Peabody Journal of Education*, 69(2), 140-153.
- Healing of the Canoe Training Centre. (2021). *Home*. Retrieved from <https://healingofthecanoe.org/>
- Healing of the Canoe. (2014, September 16). *What is Healing of the Canoe?* [Video]. YouTube. <https://www.youtube.com/watch?v=wAQ4eK7wfb8>
- Hill, R., Wicks-Arshack, A., & Miller, B. G. (2017, October). Burning wisdom: The canoe as a vessel for learning. *Clearing Magazine*. https://www.researchgate.net/publication/323108703_Burning_Wisdom_The_Canoe_as_a_Vessel_for_Learning
- Hopper, T. (2017, February 21). Everyone was dead: When Europeans first came to B.C., they stepped into the aftermath of a holocaust. *National Post*. <https://nationalpost.com/news/canada/everyone-was-dead-when-europeans-first-came-to-b-c-they-confronted-the-aftermath-of-a-holocaust>

- Lee, R. A., Balick, M. J., Ling, D. L., Sohl, F., Brosi, B. J., & Raynor, W. (2001). Cultural dynamism and change: An example from the Federated States of Micronesia. *Economic Botany*, 55(1), 9-13. As cited in Peterson, D., Hanazaki, N., & Li, F. (2019). Understanding canoe making as a process of preserving cultural heritage. *Ethnobiology Letters*, 10(1), 59-68. <https://doi.org/10.14237/ebl.10.1.2019.1363>
- Lincoln, L. (1991). *Coast Salish canoes*. The centre for wooden boats, Seattle. As cited in Wenstob, S. M. (2015). *Canoes and colony: The dugout canoe as a site of intercultural engagement in the colonial context of British Columbia (1849-1871)* [Doctoral dissertation, University of Victoria]. <http://hdl.handle.net/1828/5971>
- Marshall, T. (2011). *A tribal journey: Canoes, traditions, and cultural continuity*. [Master's thesis, Royal Roads University]. <http://hdl.handle.net/10170/448>
- Morcom, L. A. (2017). Indigenous holistic education in philosophy and practice, with wampum as a case study. *Foro de Educación*, 15(23), 121-138. <https://doi.org/10.14516/fde.572>
- Mosquito Creek Marina & Boatyard. (2021). Jerry Nahanee – His Legacy to Our Community. <https://mosquitocreekmarina.com/jerry-nahanee/>
- Neel, D. (1995). *The great canoes: Reviving a Northwest Coast tradition*. University of Washington Press. As cited in Wenstob, S. M. (2015). *Canoes and colony: The dugout canoe as a site of intercultural engagement in the colonial context of British Columbia (1849-1871)* [Doctoral dissertation, University of Victoria]. <http://hdl.handle.net/1828/5971>
- Németh, P. S. (2011). *O feitiço da Canoa Caiçara de um só tronco: A cultura imaterial de uma nação, em 25 linhas*. As cited in Peterson, D., Hanazaki, N., & Li, F. (2019). Understanding canoe making as a process of preserving cultural heritage. *Ethnobiology Letters*, 10(1), 59-68. <https://doi.org/10.14237/ebl.10.1.2019.1363>
- Newbery, L. (2012). Canoe pedagogy and colonial history: Exploring contested space of outdoor environmental education. *Canadian Journal of Environmental Education*, 17, 30-45.
- NoiseCat, J. B. (2018, May 3). The tribal canoe journey, an odyssey to reclaim tradition and territory. *Canadian Geographic*. <http://www.canadiangeographic.ca/article/tribal-canoe-journey-odyssey-reclaim-tradition-and-territory>
- Ocean Wise. (2018). *Ocean Watch: Átl'ka7tsem/Txwnéwu7ts/Howe Sound Edition*. Retrieved April 8th, 2021 from: https://oceanwatch.ca/howesound/wp-content/uploads/sites/2/2020/08/OceanWatch-HoweSoundExecutiveSummary2020_online.pdf
- Ormiston, N. T. L. (2019). Haa Shageinyaa: "Point your canoe downstream and keep your head up!" in L. T. Smith, E. Tuck & K. W. Yang (Eds.), *Indigenous and decolonizing studies in education: Mapping the long view* (pp. 38-49). Routledge.
- Peace, T. (2015). Humanities: Inheriting a Canoe Paddle: The Canoe in Discourses of English-Canadian Nationalism (Review). *University of Toronto Quarterly*, volume 84, number 3.
- Peterson, D., Hanazaki, N., & Li, F. (2019). Understanding canoe making as a process of preserving cultural heritage. *Ethnobiology Letters*, 10(1), 59-68. <https://doi.org/10.14237/ebl.10.1.2019.1363>
- Ritts, M., Johnson, K., & Peyton, J. (2018). Canoes, modernity, and the colonial imagining of progress. *GeoHumanities*, 4(2), 481-503. <https://doi.org/10.1080/2373566X.2018.1462093>
- Rogers, D. (2015). "They're not called peace canoes...": *Formal Coast Salish war canoe racing in Stó:lō history and identity*. (Ethnohistory field school report 2015). https://web.uvic.ca/stolo/pdf/Rogers_War_Canoe_Field_School_Paper_2015.pdf

- Rowe, G., Straka, S., Hart, M., Callahan, A., Robinson, D., & Robson, G. (2020). Prioritizing Indigenous Elders' knowledge for intergenerational well-being. *Canadian Journal on Aging/La Revue canadienne du vieillissement*, 39(2), 156-168. <https://doi.org/10.1017/S0714980819000631>
- Simon Fraser University (n.d.). *The Bill Reid Centre: Northwest Coast Canoes*. Retrieved January 12, 2021 from https://www.sfu.ca/brc/art_architecture/canoes.html
- Squamish Nation. (2020). *Our culture*. Retrieved January 12, 2021, from <https://www.squamish.net/about-us/our-culture/>
- Sterritt, A. (2019, April 21). The little-known history of Squamish Nation land in Vancouver. *CBC*. Retrieved January 12, 2021 from <https://www.cbc.ca/news/canada/british-columbia/little-known-history-of-squamish-nation-land-in-vancouver-1.5104584>
- Taylor, J. G. (1980). *Canoe construction in a Cree cultural tradition*. University of Ottawa Press
- U'mista Cultural Society. (2021). *Potlatch on the Northwest Coast – the value of a song*. Retrieved January 12, 2021, from <https://umistapotlatch.ca/potlatch-eng.php>
- Williams, L., & Snively, G. (2016). "Coming to know": A framework for Indigenous science education. In G. Snively, & L. Williams (Eds.), *Knowing home: Braiding Indigenous science with Western science*, Book 1 (pp. 35-51). University of Victoria
- Wenstob, S. M. (2015). *Canoes and colony: The dugout canoe as a site of intercultural engagement in the colonial context of British Columbia (1849-1871)* [Doctoral dissertation, University of Victoria]. <http://hdl.handle.net/1828/5971>
- Yumagulova, L., Woman-Munro, D. Y. O., Gabriel, C., Francis, M., Henry, S., Smith, A., & Ostertag, J. (2020). Preparing Our Home by reclaiming resilience: Lessons from Lil'wat Nation, Siksika Nation and Mohawk Nation at Akwesasne, Canada. *Nordic Journal of Comparative and International Education*, 4(1), 138-155. <https://doi.org/10.7577/njcie.3626>
- Yumagulova, L. (2020). Disrupting the riskscape of inequities: a case study of planning for resilience in Canada's Metro Vancouver region. *Cambridge Journal of Regions, Economy and Society*, 13(2), 293-318. <https://doi.org/10.1093/cjres/rsaa029>

Becoming Arctic Ambassadors: Preparing Inuit Youth for Leadership on Expeditions and Beyond

Heather E. McGregor

Abstract

This case study identifies the components of an environmental education and leadership development program that are uniquely important to engaging a specific group of learners: Inuit youth from across the Circumpolar Arctic. The introduction of a community-building pre-program, customized to the perspectives of these youth and held prior to joining a larger expedition, made a significant difference to their participation in the program. In seeking to engage, prepare, and support Indigenous youth to become environmental change leaders, this research suggests they benefit from the safety net of a peer community, allowing them to engage more fully in revealing their identities, sharing their gifts, expressing their dreams, and exposing their challenges. As a result of the pre-program, they benefitted more comprehensively from, and contributed more fully to, the larger expedition's program outcomes.

Résumé

La présente étude de cas dégage les éléments particulièrement importants que devrait intégrer tout programme d'éducation et de développement du leadership en environnement pour rejoindre un groupe précis d'apprenants : les jeunes Inuits de l'Arctique circumpolaire. L'introduction d'une activité préliminaire de développement de la conscience communautaire adaptée à la réalité de ces jeunes avant une expédition de plus grande envergure a fait une énorme différence dans leur participation au programme. Pour encourager et préparer les jeunes Autochtones à devenir des modèles dans la protection de l'environnement et la lutte contre les changements climatiques, la présente montre les avantages qu'apporte une communauté de pairs : un filet de sécurité pour exprimer son identité avec plus de confiance, mettre ses talents au service du monde, exprimer ses rêves et oser exposer ses difficultés. Grâce à l'activité préliminaire, les jeunes ont retiré de plus grands bénéfices du programme d'expédition et mieux contribué à l'atteinte de ses objectifs.

Keywords: Arctic education, Inuit education, Indigenous youth, leadership development, experiential learning, environmental education, community building

Mots-clés : éducation dans l'Arctique, éducation inuite, jeunes Autochtones, développement du leadership, apprentissage par l'expérience, éducation relative à l'environnement, développement de la conscience communautaire

Introduction

Climate crisis has already significantly affected Indigenous residents of the Circumpolar North and can be expected to continue disproportionately affecting them (International Panel on Climate Change, 2018). At the same time, Arctic peoples are saddled with many other complicated challenges: food insecurity, insufficient housing, and ongoing gaps in wellness indicators, or social determinants of health (Inuit Tapiriit Kanatami, 2014). There is an urgent need to grow the resources available for environmental education in the Arctic, echoing Leanne Simpson's (2002) call with respect to Indigenous communities across Canada. Greater supports are also needed for potential future Northern leaders; those forced to navigate the unique web of problems associated with settler colonialism, intergenerational trauma (Crawford, 2014), and climate catastrophe (Watt-Cloutier, 2016). Arguably, to reach the greatest number of people, environmental education and land-based learning in the Arctic must occur through the public school system and Arctic-based post-secondary programs. While improving public education is a national priority for Inuit (Inuit Tapiriit Kanatami, 2011) and northern Indigenous graduation rates are improving, changes to public school systems, such as Nunavut's, continue to appear incremental and slow to meet the needs of youth (Inuit Tapiriit Kanatami, 2018, p. 19; Office of the Auditor General of Canada, 2013; O'Gorman & Pandey, 2015). In the meantime, some of the most talked-about programs for Inuit youth exist outside the formal public school system. One such program is Students on Ice (SOI), a non-formal, polar expedition-based environmental education program. The research aim upon which the present article is based was to identify the key dimensions of SOI's program that significantly support Northern participants and thereby have the potential to facilitate their leadership development.

Based in Gatineau, Quebec, Canada, SOI takes students on ship-based educational expeditions to the Polar Regions. I became interested in conducting a case study of SOI's program because of its central aim of community-responsive youth leadership development: "we are dedicated to inspiring and supporting youth and providing them the necessary tools to instill positive change in their communities and around the world" (Students on Ice [SOI], 2021a). On Arctic expeditions, SOI strives for a minimum of 30% participation by youth from Circumpolar regions, such as Alaska, Northern Canada, and Greenland. These youth, who I refer to as "Northern" participants, are almost exclusively Indigenous, and most are Inuit. In 2015, SOI launched an Arctic Youth & Partnerships Program to maximize the benefits of SOI activities for Northern youth during the expedition and beyond it:

One of SOI's long-term goals is to instil in the next generation of leaders a thorough understanding of the Arctic, its history and complexities, in order to set a high standard for sustainable development, healthy communities and environmental stewardship in Canada's North. (SOI, 2021b, para 3).

A full-time SOI staff member, Caitlyn Baikie, a young Inuk and SOI alumna from Nain, Nunatsiavut, coordinated the Arctic Youth & Partnerships Program from 2015–2018. SOI also involves a notable proportion of Inuit leaders, Elders, and Northern residents as expedition staff. These efforts show that SOI recognizes how few accessible opportunities exist for Northern youth to see other parts of the Arctic region, to participate in leadership development opportunities, and to build a network of other young Northerners (SOI, 2021 b).

Evidence of SOI's successful programming can be found through anecdotes collected by SOI itself, which are made available on its website (SOI, 2021 c). Evidence can also be found in reflections of SOI educators and students that appear in other studies (Glithero & Ibrahim, 2013; Green, 2010; Raffan, 2014; Reis et al., 2015; Wyatt, 2012). Finally, ongoing participation by high profile Canadians, including well-known Northerners, on expeditions also demonstrates evidence of SOI's learning outcomes. Anecdotally, the program is successfully engaging Northerners in experiential education with lasting impacts on them as individuals, as well as on their ability to act as leaders. However, through this research I sought to document how SOI goes about designing an educational expedition that reportedly aligns with Inuit learning goals. I also aimed to consider whether this match was confirmed by the Northern youth and educators who were involved in the program. Given the disengagement of many Inuit youth from formal schooling (O'Gorman & Pandey, 2015) and the goal of SOI specifically to nurture Northern change-makers, I sought to evaluate whether SOI has unique features that align with the needs of Northern Indigenous youth. Were they features that other educators could learn from?

This case study illustrates how the introduction of a community-building pre-program, customized to the perspectives of Indigenous youth who participate in it prior to joining the expedition, made a significant difference to their participation in SOI in 2016. In seeking to engage, prepare, and support Northern Indigenous youth to become environmental change leaders, this research suggests that they need time to connect with their peers from other similar communities, opportunities to practise articulating their world views, and space to develop pride in Inuit language and culture as they go on to engage with the wider world.

Research Context

As someone who grew up in Nunavut and lived there intermittently, I had long heard about SOI. Just as I was beginning a post-doctoral fellowship in the Faculty of Education, University of Ottawa in 2015, I crossed paths with some SOI educators. We found common ground in our curiosity about the following questions: What dimensions of educational expeditions have the most significant impacts on Northern youth in terms of supporting personal growth, education, and leadership skills? What encourages engagement with important Arctic

issues such as climate change, among others? What best facilitates learning from the perspectives of Northerners about the North? SOI staff and I began to co-construct a research project to be conducted on the 2016 Arctic expedition. The full results of my study can be found elsewhere (McGregor, 2017; see also McGregor, 2018), based on methods that are discussed further below. None of my original research questions specifically focused on the pre-program—the topic of this paper—because it was newly introduced in 2016 and those of us involved did not anticipate that a separate analysis of it would necessarily be relevant. The positive impact of the pre-program became an unexpected answer to my research questions regarding the most important components of the entire program for Northern youth. Here I report on those findings by addressing the following question: What was the rationale for, and design and outcomes of, a new component of the Students on Ice expedition experience, the Northern youth pre-program?

Research Methodology

I conducted ethnographic-evaluative research through a combination of qualitative methods to uncover common meanings, perceptions, embodied experiences, and relationships held by SOI participants, to the extent such a discovery is possible (always partially, never completely). Based on the intention to describe this program from multiple perspectives and in-depth, this research can be partially viewed as ethnographic, that is, as producing knowledge that is relational, contextual, linguistic, and narrative. Identifying impacts of the educational experience may support SOI's leadership team to better evaluate what educational outcomes they are achieving (intentionally and unintentionally) and how they are achieving them. This pragmatic purpose illustrates how the research may be viewed as evaluative. In the table below, I list the methods I used to collect data and the number of participants that were part of each method. These methods were used to inform the entire research project, not just documentation of the pre-program.

SOI extensively and publicly documents expeditions through participant blogs posted on the website, as well as through professional photography, videos, student profile writing, and public presentations by students about their experience both during and after expedition (SOI, 2021d). Thus, I worked with SOI to design the methods involving students, particularly the workshops and small group interviews, in ways that would be consistent with these practices and educational goals. Although this article is not a comprehensive representation of all of my findings (see McGregor, 2017; 2018), data presented in this article with respect to the pre-program have been sourced from and informed by each of the above methods.

Timing	Method	Number of Participants
During pre-program	Pre-expedition workshop with Northern students to document expectations	28 students
During pre-program and expedition	Ongoing participant observation	
During expedition	One-on-one interviews with staff members	9 staff
	Small group interviews with a variety of students (2 to 5 students/interview, 7 interviews)	22 students
	End-of-expedition workshop with Northern students to collect reflections	9 students
After expedition	Follow-up phone calls with Northern students to collect reflections	5 students
	Analysis of SOI documents (application forms, post-expedition student and staff surveys)	

Table 1. Data Collection Methods and Participants

Ethical Considerations

This research was approved by the University of Ottawa ethics review board (REB #03-16-06). It did not require review by the Nunavut Research Institute (2018) because it occurred as part of an educational program (p. 5). In accordance with SOI advice regarding their program culture, expectations, and spirit of participation, no compensation was offered in return for participation. All participants in the research completed consent forms and were given the choice to be identified by either a pseudonym or their real name in reports and publications. Those whose names appear in this manuscript requested on their consent forms to have their real names identified alongside their quotations. They were contacted during the drafting of this manuscript to review their quotation, suggest any minor edits, and (re)confirm whether or not they would like their name included. A few quotes are included without attribution because I could not reach the individual for confirmation of permission in the context of this particular publication (though their consent form did allow for use of the quote in my research).

The Indigenous student participants were top of mind in research planning, especially because SOI can be an intense experience during which students may feel vulnerable as they stretch outside their comfort zone. In several conversations with SOI staff members, especially with Caitlyn Baikie, we agreed to guide the research in such a way that we would, we hoped, prevent concern or discomfort

on the part of SOI participants. For example, I did not attend any sessions on the topic of youth mental health, as a precaution against being perceived to be documenting activities when personal or confidential information could be shared. A Letter of Introduction was included in orientation packages provided to participants (staff, students, and parents of students) in advance. I introduced myself and the research during the Northern pre-program, and again on board the ship with all participants. Students were told that data concerning them as individuals (e.g., quotations) would only be collected if they chose to participate and signed a consent form.

SOI staff members and I agreed that it was important for students and staff to have a voice in the research and to articulate the growth they experienced for themselves. Students are exposed to a wide range of learning experiences during SOI; in such a rich context, participation in research was seen as another learning opportunity. For example, participation in the research could give students practice reviewing and filling out a research consent form. However, we agreed the research should not actively enhance, shape, or change the education program, nor should it alter student participation in it. Thus, research activities were designed to be reflective, and efforts were made to ensure participation in the research did not require students to miss out on other opportunities (e.g., small group interviews were not conducted during programmed time).

Limitations

The rate of participation in each method varied, consistent with the SOI culture of student choice. Students with the highest needs, those who were struggling with their feelings, or those who were least likely to take initiative to seek educator support may also have been those students who chose not to participate in the research. I was unable to ensure representation of the whole group of Northern students in each method; for example, noticeably fewer male Northern students participated. Furthermore, the extent to which long-term impacts of SOI on the Northern youth can be identified from this research is limited. A small number of follow up calls were held with some students, but what they said about anticipated impacts on them after the expedition does not necessarily mean those impacts came to fruition. Further study would be needed to correlate an SOI experience with long-term outcomes. I was solely responsible for analysis of the data and constructing the findings, and several full-time SOI staff members were invited to read and comment on drafts of my final report (McGregor, 2017). Some might view that as a missed opportunity to involve more SOI staff or SOI participants in contributing more comprehensively to the research outcomes. As mentioned above, however, participants who are named in this article were invited to offer comments on a draft of this publication.

SOI Expeditions: Once-in-a-Lifetime Experience

Participation in SOI makes youth feel important and special right from the get-go because program admission is competitive, expensive, and very diverse (in 2016 there were 118 students from 9 countries, including Canada, from which there were participants representing 11 provinces and territories). SOI applicants, the majority of whom are 16–18 years old, must be registered students (high school or post-secondary). They are required to fill out a written application form, apply for scholarship funding, and provide two references. Students are admitted on the basis of their desire to learn, leadership potential, involvement in the community, passion, and vision for making change. The fee for travel was \$11,900 CDN in 2016, and 77% of all students, including 100% of Northern students, received scholarships to cover those fees. For these reasons among others, students are very aware that this is a rare opportunity. In 2016, there were 45 Northern youth (33 females, 12 males), representing 38% of the registered students, with 40 who self-identified as Inuit, 3 as First Nations, and 2 as non-Indigenous. These participants came from Alaska (1), Northwest Territories (outside Inuvialuit) (3), Inuvialuit Settlement Region (2), Northern Manitoba (1), Nunavik (8), Nunavut (20), Nunatsiavut (7), and Greenland (3). For some, the trip represented one of only a handful of trips they had taken outside their home community. For many, it was first time leaving Canada, which required that they obtain a passport. A few had already travelled extensively in Canada, been to Greenland, or had been on international cultural exchanges.

SOI provides a high student–educator ratio. The 73 educators on board include a handful of staff employed directly and full-time by SOI, but the majority are recruited specifically for their expertise in sciences, arts, culture, expeditions, medicine, politics, or other areas (most participate on their vacation time). This includes some individuals who have national prominence or even celebrity status; it is not lost on students that they get to travel for several weeks with people whom they would not likely run into in their everyday lives. Among educators in 2016 were 14 Inuit, 3 First Nations or Métis, 9 non-Indigenous who live in the Northern regions noted above, and 47 non-Indigenous educators who live elsewhere in Canada or internationally. Among the Inuit educators were 1 female and 2 male Elders who shared their extensive knowledge and skills. A mental health counsellor originally from Nunavut tirelessly attended to the emotional needs of all students, particularly the Northern students, in both English and Inuktitut.

Travel in the Arctic is inherently unpredictable to begin with, given changeable weather and ice conditions. Likewise, opportunities that arise (e.g., wildlife sightings) can shift curricular plans in an instant. “A typical SOI day” is a contradiction in terms. One of the mantras used repeatedly by Expedition Leader, Geoff Green, to ensure a successful expedition is, “Flexibility is key.” The program takes place on an ice-class cruise ship. Each day begins with wake-up at 7:00 a.m. and ends around 10:30 p.m. Participants gather together twice

daily for briefings in the morning and evening. Core activities might include the following: 1) Arctic Hours—students choose to attend one of three presentations by education staff; 2) Ship-Based Workshops—students choose to attend one of eight workshops (e.g., introduction to photography, traditional sewing, drum dancing, mental health matters, science lab analysis, song writing); 3) Outings to the ice, sea, or land (travelling by Zodiac)—students choose one of several workshops offered by education staff on land (e.g., outdoor painting, Arctic plants walk, storytelling, seashore biology walk, fishing, qajaqing, stand-up paddleboarding). The expedition plans also feature community visits in both Greenland and the Canadian Arctic to connect with residents of the region on both sides of the Davis Strait. Evening briefings include inviting students to share the best moments of the day, a short story or presentation delivered by educators, background information on the activities that will follow the next day, special photographs or videos of the journey, and musical performances by musicians and collaborating students. I share these details to convey that with such an emergent and shifting curriculum, students soon recognize that they must always be ready to seize the moment. With hesitation, they could miss something truly special.

Typical Northern Student Journey: SOI's Rationale for a Pre-Program

I sought to identify the assumptions guiding SOI's efforts to tailor their education program to Northerners. While generalizations do not apply in every case, the following is a description of the typical Northern student experience on SOI expeditions prior to 2016, based on synthesis of staff interviews. (While I tried to consistently refer to these youth as "Northern" in order to be inclusive of anyone who resides in the Arctic, a majority of Northern youth are Inuit. Several staff specifically noted they were thinking of Inuit youth as they talked during our interviews). These assumptions are relevant to consider closely because they led to the introduction of a Northern student-specific pre-program in 2016. They are also pertinent because they provide insight into the conditions that educators and program coordinators from other contexts (e.g., post-secondary programs) might face in supporting Northern youth.

Northern participants are often leaving their communities for the first time on their own. They arrive in Ottawa, where the expedition begins, and find the big city overwhelming and intimidating. The weather is hot, they are meeting many people at one time, they feel homesick, and they are not used to adults they don't know telling them what to do. At first, Northern youth tend to be (or are perceived by others as) quiet, observant, reserved, insecure, nervous, or shy. This is how one participant, staff member Caitlyn Baikie, explained it to me:

I'm thinking of the 15- and 16-year-olds, most of them are coming from a place where everyone around them, their entire community, is their lifeline. Everybody that they see, whether they're related by blood or not, they're still family. It is

who they are. We've plucked them out of that for the first time, and we take them to the south where it's very intimidating. For somebody that's doing it for the first time, and at such a young age, and taking them away from that lifeline and where they get their confidence and sense of self from—that's a lot on its own. For any student coming here ... everybody will be so confused on how to make sense of this. The northern youth have this added layer of complexity and it requires understanding from SOI of where they're coming from for them to feel ok, to feel confident, to really get something out of it. Then we're taking these youth back to a place that's familiar, but still unknown, so how does that make sense?

Halfway through the expedition, or later, Northern students tend to extend their new relationships to other students or staff, beyond the other Inuit participants. Later in the program, they begin to take initiative, start conversations, express themselves more outwardly, and show their personalities. As a result of the expedition, Northern students are said to develop more confidence, feel the encouragement of people outside their families or communities, express more pride in their identity, culture, and where they are from, see more options for their future, or express more of a sense of control over their destiny.

The staff narratives were not exclusively deficit-based with regard to Northern students. Staff also spoke of these students' unique strengths and commonalities. They said that many Northern students possessed curiosity, a welcoming spirit, and a sense of humour. They demonstrated expertise in Northern life and animals, a willingness to teach Inuit language, and a sense of place, connection to the land, and love of the land.

Staff members also helped to identify the unique needs Northern youth bring to SOI expeditions. They require more support in terms of time, sourcing clothes or items for the trip, and social/emotional coaching before the expedition begins. During the expedition, they are said to benefit from interactions with other Inuit on board who help them feel comfortable. They are also said to benefit from culturally appropriate counsellors, staff who understand and respond to their homesickness, peers and staff who understand or relate to the intensity and degree of difference in their experience, and opportunities to observe peers responding to situations outside their comfort zone.

The role of Northern youth as representatives of their own communities, and of the Arctic region generally, is both a challenge and an opportunity for them. One participant and staff member shared that they think youth sometimes start out wondering why other participants are so excited about a place (their small, isolated home communities or regions) that they usually perceive as boring or limited. However, seeing new parts of the Arctic, or seeing it through visitors' eyes, makes them feel special to be from the Arctic. Some also often have iconic northern experiences—like seeing a polar bear—which they may not have had before. Shirley Manh, a long-term full-time SOI staff member and participant, explained:

Also, the curiosity of all the other passengers ... all the other students and staff who haven't been exposed to the language, the culture, the food, the land, everything. I hope that part of that is because we've tried to instill a curiosity in them. Yeah so that "collision of curiosity" makes Northern youth feel like they now have this privileged position in life, which they probably didn't feel like they had before. "Wow, now I'm in a position to tell people things, to answer questions and to share. I'm in a position where I feel proud of these things." I can't say it for everyone but certainly, a lot of the students probably have not felt that very often in their lives.

I asked Ashlee Cunsolo, a staff member and participant who was particularly sensitive to the Northern students, specifically about whether she thought the expectation that students become "Arctic ambassadors" puts pressure on them to speak to others on behalf of their communities or about their homelands, culture, society and priorities, alongside simply learning and making it through the expedition. She responded, "Northern youth have a much larger burden on this expedition, from the pressure of being the Arctic ambassador in their own homelands, being away from the land, family, and community, being on the ship, confronting their own experiences with colonization. It's a lot." Another staff member and participant said the onus should never be on an Inuk to teach about their reality—like "tokenism due to identity," as she put it. However, she added that Inuit tend to be welcoming and inclusive, and that they enjoy sharing information for a common goal. She noted that SOI provides a stepping-stone to learning how to do that.

All of these findings could be informative for, and help to orient, educators who seek to support Northern youth in other programs or contexts. However, specific to the SOI program (which is limited to several weeks), staff interviews revealed that SOI educators are concerned about finding ways to draw Northern students out early in the expedition to maximize their experiences. One staff participant characterized the sense of discomfort at the beginning of the expedition as being so strong that students "lose out on the experience." Another said Northern youth comparatively show their growth more than students from elsewhere. They added that, because it tends to take a bit longer for these youth to demonstrate their growth, it is also more rewarding to be part of that experience. These observations begin to explain how the Northern youth learning journey is different from other youth, and why a pre-program specifically for Northern youth was seen to potentially have value.

Northern Student Pre-Program

In 2016, SOI piloted a pre-program for Northern youth who were participating in the expedition. This event took place prior to the arrival of other students for the expedition. In subsequent years, it was given the Inuktitut name *Saavittut*, meaning "taking off from the shore." It was developed in collaboration with, and hosted by, the post-secondary program Nunavut Sivuniksavut (NS), in Ottawa.

NS is a two-year college-accredited program designed exclusively for Inuit youth. Students usually come from Nunavut, but the program is also open to applicants from other Inuit regions. SOI and NS share a large number of alumni (i.e., students who participate in both programs). SOI saw NS's educational philosophy and culturally responsive approaches as closely aligning with their own interest in preparing Inuit youth to become "ambassadors" for the Arctic. With this shared interest, SOI could count on NS to consider the range of needs Inuit youth have when leaving their home communities for an intense educational experience.

The pre-program was scheduled over two days. Due to limited flight options from small northern communities, Northern youth began arriving in Ottawa as early as five days before the pre-program (in addition to staying longer at the end of the expedition). In past years, flight arrangements had resulted in Northern students' early arrival, but this was the first year their time was leveraged intentionally for pre-program participation to advance their educational experience. Students were accommodated at University of Ottawa residences, ate in the university cafeteria or were provided catering, and walked together around Ottawa for daily programming. A few students knew one or two other participants who were from the same community, but for the most part they were meeting for the first time. Caitlyn Baikie took the administrative lead on behalf of SOI in planning, coordinating, and supervising the pre-program. Four NS instructors took responsibility for designing and facilitating most of the curriculum, with the exception of some presentations arranged by SOI. Eight SOI staff members also arrived early to assist Caitlyn with supervision and support. These were mostly Inuit or Indigenous educators, or other long-term Northerners, including me. Other staff dropped in occasionally. Caitlyn and the pre-program SOI staff were on duty from wake-up until bedtime throughout the pre-program.

The goals of the Northern pre-program, according to Caitlyn, were threefold: 1) provide a "softer landing" or easier transition into the SOI experience; 2) provide a toolkit for making the most of the expedition experience; and 3) help students see that they already possess a toolkit that they can share with others, along with sharing who they are. Caitlyn spoke with me about wanting youth to be proud of themselves and recognize the expertise that they already have. Specifically, she said, "I hope that youth will have a sense of confidence. I'm not expecting that they're all going to be so outgoing or outspoken. But no matter where they are, whether they're in their household, or travelling, or in a classroom in school, or their career, I want them to have that confidence."

Program Pedagogies

The Northern student pre-program curriculum occurred through rotating small group breakout sessions consisting of discussions and activities about themes of Northern life. Each session was facilitated by an NS instructor, or in some cases,

recent NS grads who were also participating in SOI as students. These older students modelled leadership skills on several occasions during the expedition as well.

During the pre-program sessions, students were invited to describe their world (food, art, hunting, environment, etc.). In doing so, they were comparing life in their own community to life in their peers' Inuit homelands (Alaska, Canada, Greenland). They were recognizing the significant similarities among Arctic communities, as well as the differences, while learning about each other in the process. They practised articulating that which is taken for granted around them—that which is “normal”—so that they might be able to share their knowledge with those visiting the Arctic for the first time and answer the many questions that visitors pose. The program also tries to support students who begin with vastly different family, home, school and life experiences. For example, some arrive with little in the way of Inuit language or cultural skills. SOI program participant David Gray, an educator and Northern expert who has participated in SOI since 2004, explained:

For the kids who don't have that background—they don't have parents or grandparents that teach them about traditional ways, they don't get out on the land. For those kids to come into NS with a bunch of other northern students, and go through some of the basics about their language, culture, traditions and knowledge. I think that's really important. It puts them on more of an even footing with other kids. And then they're encouraged to take what they're learning or what they already know, and share it with the kids they're going to meet on the trip from the south.

In talking about and comparing their experiences, students were also beginning to identify issues and challenges with regard to Northern life that need to change (e.g., food security, standard of housing). These conversations helped students prepare to participate in SOI's leadership development goals, where significant aspects of programming in the latter half of the expedition focus on making change in students' home communities. In general, I observed these sessions to be relatively easy for students to participate in, and likely familiar to them in relation to their school experiences. Some individuals were soft-spoken or reluctant to speak up while others showed disinterest, but the instructors were casual and unfazed by their varying levels of engagement.

Community Building: An Emergent Strength

In addition to facilitated pre-program activities, there was a significant amount of time each day for youth to get to know each other socially or informally. During walks to and from NS, as well as during breaks and meals, students connected on their own terms. This led to the development of strong friendships and the exploration of common interests. SOI participant Genevieve Killulark, an Inuk staff member, described these connections as follows:

The stories that were shared during lunch breaks—they were the most powerful. They would give tidbits of information during formal programs and that would spark up conversation during breaks. In terms of programming, I would say practicing songs: that sense of group camaraderie. That sense of pride, like we're all in this together, we'll all learn this together, and share this together, with others. That was quite powerful.

I observed more than one occasion when someone seemed upset or felt homesick, and it was the support or initiative of another student that helped cheer them up and reintegrate them into activities. Especially as a result of an evening of sharing Inuit musical traditions from different regions, the youth seemed to develop a sense of community they could draw on to share with the larger expedition group. Caitlyn Baikie identified this community building as an unexpected outcome that could become a goal for the pre-program in future. She said it exceeded SOI's expectations and became a "toolkit" in itself for them to share with other students:

By having them at NS immediately they met 42 other individuals coming from a place just like them. That community was built. And now they're sharing that community. Whereas before it was about fighting that battle on their own, building community on their own. And that's hard.

Outcomes of the Pre-Program According to Students

The pre-program was mentioned a number of times in response to a range of indirect questions during small group interviews with students. The following are examples of comments that emerged. When asked to share a challenging experience during the expedition, a student said the pre-program was challenging partly because it prompted them to ask themselves, "Who am I as an Inuk?" They went on to say that learning about Canadian Inuit history made them thankful to be Greenlandic and then referred to some of the more difficult recent experiences of colonization. One student referred to Caitlyn as an "Inuk role model," explaining that Caitlyn's organization of the pre-program allowed the youth to learn about their culture. Another student said that, at the beginning of the pre-program, they thought, "this isn't what I want to do." However, following discussions about how important it is to be part of your culture, they felt more strongly about learning their culture: "I always thought the Inuit culture wasn't strong but I realized when I went to NS we are the strongest of the Aboriginal cultures out there."

Students also expressed renewed commitment to Inuit culture in their everyday life back home. When asked what they learned about themselves during the expedition, one student responded that visiting NS made them want to go there for school. They realized that culture and language are not as much of a priority in their home region as they are in others, and thought that NS might help them grow. Another student agreed they would like to go to NS but

didn't know if the courses would allow them to get a job. They hoped to have a job related to Inuit culture.

In a small group interview I held with students from Nunatsiavut exclusively, I asked whether the activities during the pre-program had been helpful to them. One student identified the session on Inuit history as particularly important. This is notable because it was delivered by two students who were both NS graduates and SOI participants in 2016. Another mentioned the session on different dialects of Inuit language as important. Lastly, a student said, "we already knew some of it." While this could be interpreted as a criticism, it also reflects one purpose of the program: to elicit from students what they already know that they may wish to share with people they meet. In the workshop held at the end of the expedition I asked students to name "a moment from the expedition you will always remember." One student wrote, "The time at NS pre-program because I saw new things, learned more about my culture." For the pre-program to stand out from the entire experience shows its power for this particular student. Finally, this quote from a well-travelled, older Northern student who participated in the pre-program exemplifies why such a program is warranted:

Inuit youth are so shy when they meet new people, and they opened up instantly. How they've been on this trip, it wouldn't have been that way without the pre-program. They're so open and excited to meet everyone, whereas in programs I've done before, and stories I've heard of the past, the Inuit youth usually take until the last day to really open up. I think it's really good that there's a pre-program.

Outcomes of the Pre-Program According to Staff

Staff shared the following examples of observable outcomes from the pre-program for Northern students, which they witnessed during the 2016 expedition. Many Northern students appeared more comfortable in new situations. They demonstrated confidence by sitting at the front of the entire expedition group during briefings, whereas in the past they would stay at the back. Even more notably, they eagerly and publicly asked questions of the Expedition Leader at the first briefing. Other examples included looking staff they had just met in the eye, taking the initiative to introduce themselves, striking up conversations, or asking questions. Staff noted that students referred back to what happened in the pre-program during conversations, showing they were still thinking about it later, or found value in it. The Northern students seemed to feel less homesickness when compared with previous expeditions, where it would carry on for a week. The Northern youth actively participated in musical performances in front of the entire group, showing a willingness to take risks and be vulnerable. Overall, their social interactions were characterized by less cultural "clumping," that is, where

Inuit students only connect with other Inuit students. They branched out from the social network they established amongst the Northern youth to create a larger network with the other youth. Lastly, staff attributed to the pre-program students' enhanced sense of pride (in where they come from and in sharing their experiences) when it was compared with students on past expeditions.

Conclusion

Arctic communities in Canada and across the Circumpolar North have many strengths. They also have significant needs, especially as climate change creates an increasingly unpredictable future. Young people who can act as spokespersons, facilitators, and leaders in their communities are needed now more than ever. Educational opportunities to develop those skills and capacities are highly valuable in a context strained for resources. SOI has intentionally worked toward supporting Northern youth to become change leaders. However, program participants noted that in years prior to 2016, the Northern students might not have gained from the program or contributed to it as much as they potentially could. The degree of difference in context (environment, social, cultural, language, etc.) between their home life experiences and the SOI expedition were challenging to navigate in the short period of a two- to three-week trip.

With the advent of the Northern youth pre-program in 2016, this hindrance was seen to change, as the quotations throughout this article demonstrate. Although the pre-program showed great strengths, there is room for improvement, as there would be for any first-time initiative. I made numerous specific, concrete, and largely logistical recommendations to SOI about improving the pre-program on the basis of data collected during this research, all of which can be found in the final report (McGregor, 2017, p. 35). Examples of the recommendations include the following: providing a specific hot-weather packing list to participants for their time in Ottawa; planning more physical activity during the pre-program; building in a process for individual goal-setting; and explaining that students can communicate with family during the expedition (by posting blog entries) to reduce anxiety about being out of contact. Despite these relatively minor and logistical suggestions, the approach taken by SOI and their institutional partner, NS, to invite Northern youth to articulate and reflect on who they are, and where they come from, is highly valuable in orienting them to their own strengths, fostering pride in their culture, and offering reasons to share their perspectives with others.

The opportunity for Northern youth to come together, introduce themselves, and form bonds before meeting youth and adults from elsewhere around the world on the expedition made a great difference to the participants' experience in SOI. Community-building and intentional cultivation of a sense of belonging endured through the rest of the expedition. According to my observations, that community was warmly extended by the Northern youth to those who

were visiting the Arctic for the first time. The pre-program created a safety net of commonality in a foreign situation, allowing youth to engage more fully in revealing their identities, sharing their gifts, expressing their dreams, and exposing their challenges. Although SOI has long been called a “life-changing” experience among SOI alumni, the Northern pre-program seemed to accelerate that potential in speed and degree for Northerners. SOI has since made the pre-program a permanent part of their expedition plans and successfully hosted it at NS again in 2017, 2018, and 2019.

Simpson (2002) has pointed out that few environmental post-secondary programs are appropriately customized for Indigenous students, that is, for their unique communities and the matrix of intertwined social and environmental issues they face. SOI is not accredited (although some students have received credit for their learning from their home institutions), but it engages Northern Indigenous youth in environmental education and leadership with the hope of supporting them to continue to post-secondary education or pursue other forms of personal development. Simpson (2002) has identified important characteristics of environmental education programs for Indigenous learners: centring Indigenous knowledge, including Elders as experts; grounding programs in Indigenous philosophies of education; utilizing Indigenous pedagogies and languages; connecting to the land; making space for resistance; and supporting decolonization. As a result of my research with SOI, I would add to Simpson’s list the importance of creating an intentional “soft landing,” or a welcoming community, in which Indigenous identities, experiences, and knowledge are affirmed prior to the start of programming or arrival of other participants.

The benefits of a community-building pre-program or orientation are relevant to educational contexts beyond SOI. This article is intended to shine light on some of the considerations necessary in enhancing programs for Inuit or other Indigenous youth elsewhere, including post-secondary access programs. As program coordinators and educators plan and design learning that is intended to empower youth, providing tailored student supports for Indigenous learners is essential (see also Crooks et al., 2010). Such efforts account for the ongoing legacies of colonization, marginalization, and racism which shape Indigenous student experiences to this day (Dion, 2016; Hare & Pidgeon, 2011). Students— especially those coming from remote regions or communities—are likely to benefit from affirmation before they embark on either the main journey or other high-stakes activities, such as coursework that is being evaluated for credit. This affirmation helps students recognize that their lived experience is valued and valuable because it is both unique and shared by others. To receive that affirmation and strength from a network of youth who can grow and flourish together is among the most important resources we can offer the next generation of leaders.

Funding

This article draws on research supported by the Social Sciences and Humanities Research Council. Travel funding associated with this project was provided by Students on Ice.

Acknowledgements

I am very grateful to all members of the Students on Ice community and expedition in 2016 who participated in this research, especially Caitlyn Baikie and others who are named in this article. Special thanks to Lisa (Diz) Glithero for editorial guidance and the anonymous reviewers who strengthened my writing. All outstanding omissions and mistakes are my own.

References

- Crawford, A. (2014). "The trauma experienced by generations past having an effect in their descendants": Narrative and historical trauma among Inuit in Nunavut, Canada. *Transcultural Psychiatry*, 51(3), 339-369. <https://doi.org/10.1177/1363461512467161>
- Crooks, C. V., Chiodo, D., Thomas, D., & Hughes, R. (2010). Strengths-based programming for First Nations youth in schools: Building engagement through healthy relationships and leadership skills. *International Journal of Mental Health & Addiction*, 8, 160-173. <https://doi.org/10.1007/s11469-009-9242-0>
- Dion, S. D. (2016). Mediating the space between: Voices of Indigenous youth and voices of educators in service of reconciliation. *Canadian Review of Sociology*, 53(4), 468-473. <https://doi.org/10.1111/cars.12128>
- Glithero, L., & Ibrahim, A. (2013). Pedagogy of the moment: A journey on becoming wide-awake. *Transnational Curriculum Inquiry*, 9(2), 3-17. <https://doi.org/10.14288/tci.v9i2.183861>
- Green, G. (2010). Students on Ice: Learning in the greatest classrooms on Earth. In M. Luck, P. T. Maher, & E. J. Stewart (Eds.), *Cruise tourism in the Polar regions: Promoting environmental and social sustainability?* (pp. 93-105). Earthscan.
- Hare, J., & Pidgeon, M. (2011). The way of the warrior: Indigenous youth navigating the challenges of schooling. *Canadian Journal of Education/Revue Canadienne De l'éducation*, 34(2), 93-111. <https://journals.sfu.ca/cje/index.php/cje-rce/article/view/908>
- International Panel on Climate Change. (2018). Summary for policymakers. In V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, & T. Waterfield (Eds.), *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. World Meteorological Organization. https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_version_stand_alone_LR.pdf

- Inuit Tapiriit Kanatami. (2011). *First Canadians, Canadians first: National strategy on Inuit education*. <https://itk.ca/wp-content/uploads/2011/06/National-Strategy-on-Inuit-Education-2011.pdf>
- Inuit Tapiriit Kanatami. (2014). *Social determinants of Inuit health in Canada*. https://www.itk.ca/wp-content/uploads/2016/07/ITK_Social_Determinants_Report.pdf
- Inuit Tapiriit Kanatami. (2018). *Inuit statistical profile*. <https://www.itk.ca/wp-content/uploads/2018/08/Inuit-Statistical-Profile.pdf>
- McGregor, H. E. (2017). *Northern perspectives on board Students on Ice, and beyond: A report on the 2016 expedition*. <http://hdl.handle.net/1974/28707>
- McGregor, H. E. (2018). An Arctic encounter with Indigenous and non-Indigenous youth as pedagogy for historical consciousness and decolonizing. *Historical Encounters: A Journal of Historical Consciousness, Historical Cultures, and History Education*, 5(1), 90-101. <http://hej.hermes-history.net/index.php/HEJ/article/view/101/86>
- Nunavut Research Institute. (2018). *Obtaining a research license under Nunavut's Scientists Act: A guide for applicants*. https://www.nri.nu.ca/sites/default/files/public/nri_research_licence_application_guidelines.pdf
- Office of the Auditor General of Canada. (2013). *Report of the Auditor General of Canada to the legislative assembly of Nunavut: Education in Nunavut*. Ministry of Public Works and Government Services. http://publications.gc.ca/collections/collection_2013/bvg-oag/FA3-88-2013-eng.pdf
- O'Gorman, M., & Pandey, M. (2015, September 23). *Cultivating the Arctic's most valuable resource: An analysis of the barriers to high school completion among youth in Nunavut* (Research report). University of Winnipeg.
- Raffan, J. (2014). *Circling the midnight sun: Culture and change in the invisible Arctic*. HarperCollins Publishers.
- Reis, G., Ng-A-Fook, N., & Glithero, L. (2015). Provoking EcoJustice—Taking citizen science and youth activism beyond the school curriculum. In M. P. Mueller & D. J. Tippins (Eds.), *EcoJustice, Citizen science and youth activism: Situated tensions for science education* (pp. 39-61). Springer International Publishing.
- Simpson, L. (2002). Indigenous environmental education for cultural survival. *Canadian Journal of Environmental Education*, 7(1), 13-25. <https://cjee.lakeheadu.ca/article/view/271>
- Students on Ice. (2021a, March 28). *Our mandate*. <https://studentsonice.com/about-us/our-mandate/>
- Students on Ice. (2021b, March 28). *Arctic Youth and Partnerships Program*. <https://studentsonice.com/programs/program/arctic-youth-and-partnerships-program/>
- Students on Ice. (2021c, March 28). *Students on Ice: About us*. <http://studentsonice.com/about-us/>
- Students on Ice. (2021d, March 28). *Arctic expedition 2016*. <https://studentsonice.com/expedition/arctic-expedition-2016/>
- Watt-Cloutier, S. (2016, October). Everything is connected: How marine spatial planning links environment, economy, sustainability, human rights & leadership in the twenty-first century Arctic. *Northern Public Affairs*, 4(3), 15-19.
- Wyatt, S. L. S. (2012). *Stories of Arctic wonder: Exploring transformative environmental education*. [Unpublished master's thesis]. Royal Roads University.

«Nous sommes d'océan»

Nancy Breton, Laurentides, Québec



«Nous sommes d'océan»

Je peins à partir de mon vécu avec l'océan et de réflexions partagées. Dans mon atelier, je cherche à traduire l'océan, cette nature qui ignore nos désastres, son renouvellement perpétuel, qui lave, ravage et apaise à la fois. Par la couleur j'essaie de traduire l'émotion qui me guide. La mer aime le ciel. Un rapport à sa vastitude qui monte jusqu'au Grand Nord où mon cœur demeure ainsi qu'aux déclinaisons de lumière. Je suis plongée dans un état de « poécité » où le réel est hors norme, sans contrôle du quotidien. Où s'en va la mer ? Où allons-nous en ces temps incertains ? Retour aux priorités et à la nature. Qu'aurons-nous compris ?

L'océan est complexe et je veux en témoigner, par des éléments dynamiques et symboliques. Le rôle de l'océan dans notre culture est important depuis des siècles et je lis que les gens vivent la mer de manière contradictoire: puissante mais sereine, belle mais dangereuse. Un rapport à ce qu'on préfère nommer «la mer», plus familier, unique et multiple. L'humanité demeure, le petit bateau, petite pièce fragile vogue sur l'eau, malgré tout. Un rêve qui veille, la mer au cœur généreux qui nous donne envie d'y plonger et de faire des culbutes. Et la brise qui apporte, à la terre envieuse, son souffle salé, son côté apaisant et énergique.

Ma démarche se poursuit d'une conscientisation de ce qui se vit au Québec, de ce qui m'a été rapporté, une mer de mots reçus qui déferlent comme les vagues. Fragile équilibre que je cherche à travers la composition. Je m'intéresse aux relations, entre l'Humain et l'environnement, entre le conscient et

l'inconscient: un écosystème en soi. Ces enseignements ne peuvent que nous apporter sagesse et adaptation. La nature réagit en symbiose avec l'Humain et tous les éléments: l'air, la terre, l'eau. Nous sommes d'océan.

"We Are the Ocean"

I paint from my experience with the ocean and from shared reflections. In my studio, I seek to translate the ocean, this natural force that ignores our disasters; its perpetual renewal that washes, ravages, and soothes at the same time. Through colours I try to translate the emotion that guides me. The sea loves the sky. A link to its vastness which extends to the North where my heart remains, as well as to the variations of light. I am immersed in a state of "poeticity" where reality is extraordinary, without daily control. Where is the sea going? Where are we going in these uncertain times? Back to priorities and nature. What will we understand?

The ocean is complex, and I want to attest to this fact by using dynamic and symbolic elements. The role of the ocean in our culture has been important for centuries and I have read that people experience the sea in contradictory ways: powerful but serene, beautiful but dangerous. A relationship with what we prefer to call "the sea," more familiar, single and multiple. Humanity remains, a little boat, fragile, sails on the water, despite everything. A dream that keeps watch, the sea with a generous heart that makes us want to dive in and tumble. And the breeze that brings, to the envious earth, its salty breath, its soothing and energetic side.

My approach continues with an awareness of what is happening in Quebec, of what has been reported to me, a sea of received words that break like the waves. A fragile balance that I seek through composition. I am interested in relationships: between humans and the environment, between the conscious and the unconscious—an ecosystem in itself. These teachings can only bring us wisdom and adaptation. Nature reacts in symbiosis with humans and all the elements: air, earth, water. We are the ocean.

Éducation à l'environnement et au développement durable du Saint-Laurent : une démarche éducative pour susciter les apprentissages et développer le pouvoir agir de jeunes Québécois du secondaire

Émilie Morin, Unité départementale des sciences de l'éducation de Rimouski, Université du Québec à Rimouski; Geneviève Therriault, Unité départementale des sciences de l'éducation de Rimouski, Université du Québec à Rimouski; Barbara Bader, Faculté des sciences de l'éducation, Université Laval; and Dany Dumont, Institut des sciences de la mer de Rimouski

Résumé

Face aux problématiques environnementales actuelles, l'école secondaire doit contribuer au développement du pouvoir agir des jeunes. C'est en nous inspirant d'une posture transformatrice que nous avons abordé une thématique importante pour l'identité, l'histoire, la culture et l'économie de la société québécoise : le Saint-Laurent. Notre projet de recherche nous a conduits à nous intéresser aux apprentissages significatifs ainsi qu'au sentiment de pouvoir agir de 26 élèves de 15-16 ans qui avaient documenté des enjeux relatifs au Saint-Laurent et vécu une journée d'activités dans un parc naturel en bordure du Saint-Laurent, avec des experts. L'analyse thématique des propos d'élèves recueillis en fin de démarche pourrait inspirer une éducation à l'océan pour tous, centrée sur le développement du pouvoir agir.

Abstract

There is a duty at the high-school level to contribute to empowering youth to take action in response to current environmental issues. In our research project, we embraced a transformation-oriented stance to a subject that is vital to the identity, history, culture and economy of Quebec, namely, the St. Lawrence River. This led us to focus on meaningful learning opportunities and the sense of agency experienced by 26 students aged 15 to 16 tasked with documenting various issues related to the St. Lawrence River as part of a day-long series of expert-guided shoreline activities in a marine park. A thematic analysis of students' comments gathered at the end of the day may be used to inspire empowerment-based ocean literacy for people of all ages.

Mots-clés : Saint-Laurent, éducation à l'environnement et au développement durable (EEDD), jeunes, apprentissages significatifs, sentiment de pouvoir agir.

Keywords: St. Lawrence River, environmental and sustainability education (ESE), youth, meaningful learning, empowerment, ocean literacy.

Introduction

Diverses problématiques environnementales contribuent à augmenter les injustices au Canada et ailleurs. Il n'y a qu'à penser aux populations vulnérables qui voient leur accès à l'eau potable limité ou qui ne peuvent plus se loger de manière sécuritaire et doivent se déplacer plus loin des côtes. Face à ces injustices, il devient insoutenable de penser que l'école ne puisse être un milieu où se développe la capacité d'agir des jeunes (Zeyer et Kelsey, 2013).

C'est en tenant compte de ces considérations que nous avons mené entre 2017 et 2019 un projet de recherche France-Québec portant sur l'éducation à l'environnement et au développement durable du Saint-Laurent et de la Seine¹. Ce projet visait à concevoir de manière collaborative et à mettre en œuvre des démarches éducatives autour d'enjeux de développement durable d'un fleuve. Il visait également à caractériser le rapport aux savoirs scientifiques et définir les modalités d'engagement écocitoyen de jeunes de 16 ans face à ce fleuve. Ce projet se déroulait sur cinq territoires différents : dans les villes de Saint-Ouen, Caudebec et Lillebonne en France autour de la Seine, ainsi qu'à Québec et dans la région du Bas-Saint-Laurent sur les rives du Saint-Laurent. Une étude antérieure sur la thématique du golfe du Saint-Laurent a mis en lumière l'importance d'aborder les dimensions identitaire et culturelle du rapport à la nature, à l'école et aux savoirs scientifiques à l'école secondaire (Bader et al., 2017).

En prolongement à ce travail, cet article vise à cerner les apprentissages significatifs et les dimensions du sentiment de pouvoir agir des élèves d'une école bas-laurentienne à l'égard d'enjeux environnementaux liés au Saint-Laurent lors de la mise en œuvre d'une démarche éducative en quatrième secondaire. Cette recherche en éducation à l'environnement et au développement durable (EEDD) nous amène à formuler, à partir des propos des jeunes, des pistes pour inspirer une éducation à l'océan pour tous.

1. Enjeux liés à la protection et à une EEDD du Saint-Laurent

Le Saint-Laurent est un système côtier formé d'un fleuve, d'un estuaire et d'un golfe reliant les Grands Lacs à l'océan Atlantique. Il est bordé par cinq provinces et relie l'estuaire à la mer du Labrador via le détroit de Belle Isle, et à l'océan Atlantique via le détroit de Cabot. Ce système côtier est unique à plusieurs égards. D'abord, le Saint-Laurent draine un bassin versant d'une superficie de 1,6 million de km² et plus de 25 % des réserves mondiales d'eau douce, une richesse mondiale inestimable (Archambault et al., 2017). Ensuite, le Saint-Laurent est considéré comme la voie la plus périlleuse au monde en raison des conditions météo-océaniques variables, de sa géographie complexe et de son couvert de glace qui persiste pendant environ quatre mois chaque année (Archambault et al., 2017). Malgré tout, déjà en 2005, 255 millions de tonnes (Mt) de marchandises y transitent (Ministère des Transports, 2009) dont environ

40 % sont manutentionnées dans les 21 ports commerciaux du Québec, le reste étant destiné aux marchés ontariens ou américains.

On répertorie dix zones d'importance écologique et biologique (ZIEB) dans le Saint-Laurent (MPO, 2007). Ces écosystèmes marins et aquatiques, d'une biodiversité méconnue et souvent sous-estimée par les Québécois, produisent des ressources halieutiques supportant plusieurs industries de la pêche et de l'aquaculture. Or, si l'on compare à d'autres nations maritimes, la population québécoise ne consomme que peu des ressources récoltées dans le Saint-Laurent, celles-ci étant plutôt exportées vers d'autres marchés. En effet, selon les chiffres de 2018, 81 % des produits de la mer du Québec étaient exportés alors que 89 % des produits marins consommés au Québec étaient importés (Bourgault-Faucher, 2020).

Comme la plupart des milieux côtiers de la planète, le Saint-Laurent et sa population côtière sont soumis à des pressions d'origines naturelle ou anthropique qui soulèvent plusieurs enjeux complexes. La diminution de la durée et de l'étendue d'englacement augmente la probabilité d'aléas de submersion sur les côtes, mettant ainsi en péril plusieurs infrastructures côtières (Didier et al., 2018). La progressive diminution des concentrations d'oxygène, le réchauffement et l'acidification des eaux profondes dus aux changements climatiques, ainsi que la surpêche, la contamination des eaux et le bruit causé par les navires sont autant de facteurs pouvant perturber les écosystèmes et les espèces qui en dépendent.

À la lumière de ce qui précède, il s'avère pertinent que les jeunes Québécois parviennent, lors de leur parcours scolaire, à comprendre le système du Saint-Laurent, à mieux connaître son rôle dans l'histoire des populations et à mieux saisir son influence sur la vie actuelle des Québécois. Au cours du projet relaté dans cet article, nous nous sommes attardés au niveau secondaire, mais nous soulignons l'importance d'aborder cette thématique avec les jeunes dans un continuum cohérent et réfléchi, tout au long de leur scolarité. De plus, cet enseignement devrait miser sur le développement du pouvoir agir des jeunes de sorte qu'ils soient en mesure de faire entendre leur voix et d'agir librement en fonction de ce qu'ils considèrent comme valable.

Notons par ailleurs que les enjeux associés au Saint-Laurent se trouvent en étroite relation avec certains des objectifs d'apprentissage de développement durable (ODD) formulés par l'UNESCO (2017). Bien que ces objectifs constituent une exigence à laquelle les systèmes éducatifs à travers le monde doivent répondre, ils nous semblent peu connus et peu utilisés dans les écoles du Québec. En outre, à notre connaissance, aucune étude ne s'est intéressée à l'enseignement des questions environnementales liées au Saint-Laurent. À l'heure actuelle, certains programmes scolaires québécois du secondaire abordent la thématique du Saint-Laurent. Comme le souligne Fauville (2017) pour l'Europe, il serait intéressant de documenter un possible biais terrestre dans les programmes au Québec, les écosystèmes terrestres nous semblant plus

présents dans l'enseignement au Québec. Le thème du Saint-Laurent est évoqué à travers le domaine général de formation « Environnement et consommation » ainsi que dans les programmes de Science et technologie et d'Univers social du deuxième cycle du secondaire (Jeziorski et Therriault, 2019). Toutefois, il demeure rarement explicite, d'où la nécessité de réfléchir à une éducation à l'océan, et plus particulièrement à une éducation au Saint-Laurent, visant le développement de connaissances de l'océan (*ocean literacy*) (Glithero, 2020). Comme cela sera explicité dans cet article, cette éducation devrait toutefois également viser le développement des capacités des jeunes (Sen, 2010) et ainsi que leur sentiment de pouvoir agir (Morin et al., 2019).

Pour les besoins de cet article, nous utilisons ainsi l'expression « éducation à l'océan » pour parler d'une éducation à l'environnement et au développement durable (EEDD) propre à l'océan. Nous reconnaissons toutefois la pertinence de l'expression « connaissance de l'océan » (*ocean literacy*) (Glithero, 2020) pour parler de manière plus inclusive de la diversité des savoirs tant profanes, citoyens, qu'experts, qui apparaissent pertinents pour réfléchir et comprendre l'océan.

2. Vers une éducation transformatrice et participative visant le développement du pouvoir agir

L'éducation à l'environnement (*environmental education*) (EE), l'éducation relative à l'environnement (ERE), l'éducation au développement durable (*education for sustainable development*) (ESD) et l'éducation à l'environnement et au développement durable (EEDD) constituent quelques-unes des différentes formes d'« éducation à » l'environnement. Ces formes d'éducation représentent des domaines de recherche comportant des spécificités et des distinctions (Jickling et Wals, 2013). Bien qu'elles aient toutes des apports pertinents, nous nous rattachons davantage à une EEDD transformatrice, telle que présentée dans ce qui suit.

À l'instar des propositions définies par Jickling et Wals (2013), différentes manières de concevoir et de pratiquer l'EEDD inspirent ce qui se fait actuellement dans les classes. D'abord, diverses perspectives épistémologiques, soit *transmissive* (centrée sur des savoirs disciplinaires prédéfinis, considérés comme vrais et neutres) ou, au contraire, *transformatrice* (centrée sur la co-création de savoirs et une critique sociale) permettent de distinguer les possibles. Ensuite, selon la visée sociale privilégiée, toujours selon Jickling et Wals (2013), on peut distinguer une *visée de changement de comportements* qui correspondrait davantage à un modèle autoritaire au sein duquel il est attendu que les jeunes reproduisent un schéma social prédéfini par les adultes (l'entraînement et le conditionnement à des gestes pro-environnementaux seraient alors des approches à préconiser en EEDD), alors qu'à l'opposé, une *visée participative* valoriserait un schéma social à construire collectivement, au quotidien (le pouvoir serait alors partagé entre tous).

L'EEED qui inspire cette recherche s'inscrit davantage dans une épistémologie transformatrice et a une *visée sociale participative*, en ce sens que les jeunes y sont considérés comme des participants critiques à la construction des savoirs et des acteurs de changement (Kenis et Mathijs, 2012). Selon cette posture, les savoirs gagneraient à être présentés comme construits socialement plutôt que prescrits et fermés. Les enseignants devraient renouveler leur enseignement des problématiques sociales et environnementales (Sadler et al., 2007) afin de développer un enseignement qui soit critique et orienté vers le développement du pouvoir agir (Elshof, 2010). Pour favoriser l'action des jeunes et s'éloigner du fatalisme qui les affecte (Kelsey et Armstrong, 2012), des conditions favorables au développement d'un pouvoir agir chez les élèves de la fin du secondaire devraient être mises en place.

Lors de travaux précédents portant sur le sentiment de pouvoir agir des jeunes face aux changements climatiques (Morin et al., 2019), nous avons mis en relation ce pouvoir agir avec l'approche des capacités (Sen, 2010) ainsi que les concepts d'*empowerment* (Ibrahim et Alkire, 2007), d'*agentivité* (Glithero, 2015; Hayward, 2012) et de sentiment d'efficacité personnelle (Bandura, 2003). Tel qu'illustré précédemment, l'école, comme structure sociale, devrait être pensée pour développer les capacités des individus, c'est-à-dire leur liberté de pouvoir accomplir (ou être) ce qu'ils considèrent comme valable (Comim et al., 2011). En ce sens, les jeunes doivent être considérés comme des acteurs sociaux à part entière et doivent pouvoir, entre autres par le biais de l'école, développer les capacités nécessaires à une participation active et critique en société. Ces capacités, qui peuvent aussi être nommées libertés (Sen, 2010), peuvent se distinguer en au moins deux grandes catégories. La première, celle des libertés de bien-être et d'opportunités, rappelle l'importance que les jeunes puissent profiter de ressources et de commodités, puissent évoluer et participer au sein de contextes variés (social, politique, juridique, économique, communautaire, scolaire, familial, matériel et structurel) et facilitants, et qu'ils puissent jouir de bien-être (vie, santé, connaissances et temps). La seconde, celle des libertés de processus et de réalisation (que l'on peut aussi nommer *agentivité*), comprend certaines dimensions telles que la capacité, le choix, le contrôle direct et le pouvoir efficace, la responsabilité, la réflexivité, le résultat et l'action en elle-même. Face à ces diverses formes de libertés, les jeunes éprouvent ce que nous nommons un *sentiment de pouvoir agir*. Ce dernier concept permet de bien comprendre que les jeunes doivent pouvoir ressentir non seulement une efficacité personnelle (liée à l'action), mais également un pouvoir agir (lié aux libertés d'opportunité et de bien-être et aux libertés de processus et de réalisation) (Morin et al., 2019). Ultimement, c'est en proposant des contextes éducatifs qui offrent ces différentes possibilités de liberté que ce sentiment de pouvoir agir pourrait être développé à l'école.

Pourtant, l'éducation formelle telle qu'elle se réalise couramment contribue au découragement des jeunes (Zeyer et Kelsey, 2013). Cette situation

est moralement indéfendable. Il faut aspirer à plus de justice sociale et environnementale en reconnaissant aux jeunes toutes les capacités et la liberté d'agir en fonction de ce qu'ils croient devoir être accompli. Cela peut passer, comme nous avons tenté de le faire dans cette étude, par un enseignement plus ouvert, où les élèves peuvent faire des choix, sont en contact avec la nature et avec des experts avec lesquels ils peuvent discuter d'égal à égal et de manière libre. Le simple fait de les considérer comme des interlocuteurs valables – d'autant plus que l'on aborde une thématique locale qui les concerne directement – et de leur faire confiance dans l'organisation de leurs apprentissages peut leur permettre de : (1) réaliser des apprentissages qu'ils jugent significatifs et (2) développer leur sentiment de pouvoir agir face aux problématiques sociales et environnementales du Saint-Laurent.

3. Description de la démarche d'EEDD sur le Saint-Laurent ainsi que des méthodes de collecte et d'analyse des données

3.1 Démarche éducative

Notre démarche éducative a eu lieu dans une école se situant sur la côte de l'estuaire du Saint-Laurent de novembre 2018 à mars 2019. Nous avons collaboré avec 26 élèves de quatrième secondaire du Programme d'éducation intermédiaire (PEI). Deux enseignants coordonnateurs du programme nous ont appuyés dans l'organisation logistique de la démarche. Avec leur appui, nous avons obtenu huit périodes de cours de 75 minutes avec les élèves : quatre à l'école et quatre concentrées en une journée complète passée dans un parc naturel à proximité. Les activités réalisées ne faisaient pas l'objet d'une évaluation et nous n'étions pas contraints à respecter un programme scolaire en particulier. L'échantillon en est donc un de convenance, c'est-à-dire choisi pour son accessibilité, mais également pour la liberté qui nous était accordée. Nous sommes toutefois conscients que ce genre de collaboration privilégiée n'est pas toujours reproductible (voir, par exemple, une étude analogue réalisée dans une autre école du Québec) (Delamatta, 2020). Elle nous fait prendre conscience de la grande importance d'une collaboration entre l'école et la communauté qui l'entoure afin de faire vivre aux jeunes des projets significatifs.

Les sept équipes d'élèves ont, lors d'une première période, choisi un enjeu qui les interpelle en lien avec le Saint-Laurent : (1) la gestion de la pêche, (2) la protection de la biodiversité en lien avec l'alimentation, (3) le transport maritime, (4) l'impact des bateaux sur la biodiversité marine, (5) le littoral et l'érosion des berges, (6) les épaves et le patrimoine maritime, et finalement (7), le déversement des eaux usées. Lors d'une seconde période, ils ont débuté leur documentation de l'enjeu, en ligne, mais également à partir d'une documentation présélectionnée.

Ensuite, la journée complète passée dans le parc naturel à proximité a permis d'avoir une vue imprenable sur l'estuaire. En avant-midi, des conférenciers

invités ont parlé de leurs savoirs et de leur relation avec le Saint-Laurent. Lors de ces conférences, nous désirions que les jeunes puissent comprendre certaines pratiques de recherche et percevoir les possibilités d'engagement face aux enjeux dépeints. Plus précisément, pour nous accueillir, un naturaliste a discuté avec les jeunes des espèces présentes sur le territoire et dressé un historique du parc. Ensuite, la question de l'érosion des berges et du littoral a été abordée avec un doctorant en géographie. Une autre conférence dans le domaine de l'océanographie physique a permis de mieux comprendre la dynamique de la banquise. Pour conclure l'avant-midi, deux conférences en biologie marine et en santé publique environnementale ont soulevé les enjeux liés à la protection de la biodiversité du Saint-Laurent, tout en illustrant divers exemples d'engagement d'acteurs scientifiques et citoyens soucieux du bien commun. Les jeunes pouvaient prendre quelques notes et poser des questions aux conférenciers présents. Ils se sont montrés généralement silencieux, mais attentifs. Le dîner s'est déroulé autour d'une table remplie de produits locaux de la mer, tels que du crabe des neiges, des algues du Saint-Laurent et du maquereau. En après-midi, les élèves ont discuté pendant une heure, en petites équipes, avec un expert que nous avons contacté pour eux autour de l'enjeu qu'ils avaient à documenter. Ils sont également sortis pendant une heure afin de se familiariser avec la manipulation d'un canot à glace et avec quelques instruments de recherche (bouée de vagues, tarière, etc.). À la fin de la journée, nous avons présenté à tout le groupe le produit final attendu, soit une synthèse sous forme de réseau conceptuel. Deux autres périodes de cours ont eu lieu à l'école afin que les élèves puissent, à l'aide du logiciel de création de réseau de concepts Miro, réaliser une synthèse de leur représentation de la documentation recueillie.

3.2 Données qualitatives recueillies

L'approche méthodologique retenue pour la présente recherche en est une qualitative, s'inspirant d'un paradigme épistémologique interprétatif. L'outil principal de collecte de données est l'entretien de groupe semi-dirigé². Ces entretiens menés auprès des sept équipes permettaient de donner une voix aux jeunes. D'une durée de 45 à 60 minutes, ils ont eu lieu à deux reprises, soit au début de la mise à l'essai (décembre 2018) et un mois après la fin de la démarche (mai 2019).

Seule une partie des résultats des entretiens menés en fin de démarche sont présentés dans cet article. Les questions relatives aux apprentissages significatifs sont retenues. En voici quelques exemples : « Cette démarche vous a-t-elle permis de réaliser certains apprentissages? Si oui, lesquels? À vos yeux, est-ce que certains de ces apprentissages sont plus significatifs pour vous que d'autres? Lesquels? Pourquoi? ». Ces questions sont inspirées de la méthodologie de « bilan de savoirs » et nous permettent de cerner la signification et la valeur conférée aux savoirs acquis dans le cadre de la démarche (Charlot et al., 1992; Therriault et al., 2018). De plus, les données issues des réponses aux

questions relatives au sentiment de pouvoir agir des jeunes sont présentées dans cet article. En voici quelques exemples : « Croyez-vous que les jeunes aient le pouvoir de changer les choses? Pourquoi? Quel rôle peuvent-ils/ont-ils à jouer face aux problèmes environnementaux? ». Une analyse thématique en a été réalisée (Paillé et Mucchielli, 2016) à l'aide du logiciel NVivo12. L'analyse thématique vise à dégager des thèmes dans un corpus de données, comme c'est le cas dans plusieurs types d'analyses qualitatives (Paillé et Mucchielli, 2016).

4. Apprentissages significatifs liés aux enjeux sociaux et écologiques du Saint-Laurent

Bien que n'ayant pas suivi un programme d'étude précis, et désirant plutôt accorder une grande liberté aux élèves dans la structuration de leurs apprentissages, les apprentissages soulevés par les élèves s'avèrent nombreux, pertinents et précis. Les thèmes qui ressortent de l'analyse correspondent directement à l'enjeu choisi sur le Saint-Laurent par les équipes : (1) le littoral et l'érosion des berges, (2) le transport maritime et son impact sur les espèces, (3) l'alimentation et la pêche, (4) le patrimoine maritime, (5) le déversement des eaux usées et (6) l'alimentation. D'autres thèmes, tels que (7) les pratiques de recherche et (8) la complexité du Saint-Laurent, sont transversaux et ressortent de manière forte et indistinctement des enjeux choisis par les équipes. Dans ce qui suit, sont présentés les thèmes et sous-thèmes les plus parlants en les illustrant à l'aide d'extraits.

4.1 Le littoral et l'érosion des berges

Les quatre élèves ayant documenté cet enjeu mentionnent qu'ils étaient au fait de « son existence », mais qu'ils ne savaient pas « comment ça marche » avant la démarche. L'un d'eux explique que les infrastructures construites en bord de mer retiennent le sable et influencent ainsi le littoral. Ces élèves en retiennent que les solutions pensées et mises en place par les municipalités, qu'ils pensaient être efficaces (comme l'enrochement ou les murets), ne font en fait que retarder les dommages ou les déplacer.

(...) on dirait qu'on a appris que les choses qu'on pensait qui étaient de bonnes choses, qui avaient été faites, c'était plus des solutions « plâtres » (pansements) que d'autres choses. C'était plus des solutions à court terme qu'à long terme. Cela a été pensé pour régler le problème tout de suite, mais il faudra quand même faire de quoi plus tard. (É4, Littoral).

Ils disent également avoir pris conscience que, précédemment, les côtes étaient naturelles et qu'ainsi, l'environnement pouvait « faire son travail ». Aujourd'hui, les interventions humaines amplifient le phénomène de l'érosion.

Ils perçoivent que ce problème est un legs de la génération de leurs parents et qu'ils devront eux-mêmes y faire face. Comme l'illustre cet extrait, il faut maintenant penser de manière plus durable nos interventions face au littoral puisque celui-ci nous définit en tant que Bas-Laurentien et Gaspésien :

On est quand même concernés par le littoral, le littoral c'est chez nous. (...) il faut essayer de faire de quoi pour que ça reste parce que sinon on va perdre une grosse partie de notre tourisme. Ce qui est beau chez nous, ce qui décrit Bas-Saint-Laurent, Gaspésie..., bien tout le Québec presque, c'est le fleuve (É4, Littoral).

4.2 Le transport maritime et son impact sur les espèces

Deux équipes ayant travaillé sur ces enjeux disent avoir pris conscience des impacts du transport maritime sur les espèces présentes dans le Saint-Laurent, principalement sur les mammifères marins, et notamment des blessures et des décès occasionnés par des collisions avec des bateaux ou bien via l'altération, due au bruit des navires, de leur capacité à communiquer ou à localiser la nourriture.

Concernant la juridiction en lien avec le transport maritime, les élèves ont appris que la limitation de vitesse peut être une mesure pertinente afin de protéger certaines espèces, tout en soulignant qu'en réduisant leur vitesse, les navires passent plus de temps dans les zones où se retrouvent les mammifères marins, occasionnant ainsi d'autres problèmes.

Certains élèves n'établissaient pas de lien précis, avant l'activité, entre l'achat local et la protection de la biodiversité du Saint-Laurent, mais soulignent avoir appris que le transport maritime est le principal moyen d'approvisionnement en biens de consommation au Québec : «J'ai appris que la grande majorité des trucs étaient transportés par bateau. Je ne le savais pas. Je pensais que c'était par avion ou... par camion. Mais la majorité des affaires transportées par bateau, ça m'a surpris un peu» (É2, Transport maritime).

En ce sens, l'achat local – ou la diminution de la consommation de biens – est maintenant perçu par les élèves de ces équipes comme le moyen le plus efficace pour diminuer les impacts sur certaines espèces du Saint-Laurent, dont les mammifères marins. Cela leur a permis de mieux comprendre la responsabilité collective que nous avons face au transport maritime.

4.3 L'alimentation et la pêche

Les élèves de l'équipe qui s'est intéressée à la biodiversité et à l'alimentation mentionnent avoir appris l'existence de l'aquaculture. Ils avaient l'impression, avant la démarche, que tous les produits de la mer qu'ils consomment proviennent de la pêche commerciale.

Ils ont été surpris d'apprendre que la consommation de produits locaux de la mer n'est pas la norme, mais bien l'exception. Le fait qu'il y ait beaucoup

d'importation et d'exportation des produits de la mer leur semble étonnant, en raison de la proximité du Saint-Laurent et donc des ressources.

Il y a quelque chose qui m'a vraiment surpris. C'est que la plupart des poissons et des fruits de mer qu'on pêche ici est exporté puis une grande partie de ce qu'on mange est importé. Donc, les produits qu'on pêche ici ne sont, en majorité, pas mangés par nous. Ça fait en sorte qu'il y a de la pollution, à cause des bateaux et qu'on n'utilise pas nos ressources à nous (É1, Biodiversité et alimentation).

4.4 Apprentissages significatifs liés aux pratiques de recherche

Les élèves de deux équipes soulignent également, à l'issue de la démarche, que les chercheurs ne connaissent pas tout et que certaines choses demeurent incertaines ou inconnues à leurs yeux. Par exemple, les chercheurs ne connaissent pas les effets que certains éléments toxiques relâchés dans l'eau peuvent avoir sur la biodiversité.

Une équipe a eu l'occasion de pouvoir travailler en petit groupe avec deux expertes. Cette équipe précise que les deux expertes avaient elles aussi fait des apprentissages lors des discussions. Voici un extrait de l'entretien en question :

(...) c'était deux spécialistes de domaines différents et même elles avaient l'air d'apprendre des affaires... Une nous a parlé des hormones, puis des OGM, puis de l'élevage des poissons. Et l'autre nous a parlé des quotas, des actions qu'on peut poser (É1 et É4, Biodiversité et alimentation).

Les élèves de trois équipes différentes soulignent qu'ils ont pris conscience que les experts peuvent nous informer sur les problèmes, mais peuvent aussi nous dire comment les solutionner. Selon ces jeunes, le fait de se faire dire quels sont les problèmes n'est pas très utile. Ils sont donc rassurés que les experts puissent également inspirer les actions à mener pour faire face à ces problèmes.

4.5 Apprentissages significatifs liés à la complexité du Saint-Laurent

De manière plus générale, les équipes ont mentionné que la démarche réalisée leur a permis de constater que le Saint-Laurent, qu'elles côtoient tous les jours, depuis 16 ans, est plus complexe qu'elles ne le pensaient. Par exemple, elles ont pris conscience que le mouvement de l'eau ne peut être représenté que par une masse d'eau qui part de l'amont et qui se rend à l'aval.

Elles ont également compris que les solutions à mettre en place pour sa protection, que ce soit pour les problématiques d'érosion, de protection de la biodiversité ou de transport maritime, doivent être réfléchies. Les propos d'une élève illustrent ce que la démarche lui a permis d'apprendre :

De façon générale, une plus grande ouverture sur l'environnement, sur notre fleuve à nous. Parce qu'on parle souvent d'environnement comme les conséquences

ailleurs, mais on n'en parle pas beaucoup au Québec. Moi j'ai bien aimé, j'en ai appris plus sur le fleuve Saint-Laurent. J'habite ici depuis 16 ans puis je n'avais jamais..., je ne savais pas qu'il y avait des conséquences qui se déroulaient dans notre fleuve (É1, Pêche).

5. *Le sentiment de pouvoir agir*

Lorsqu'on les questionne à savoir s'ils sentent qu'ils peuvent agir face aux divers enjeux documentés sur le Saint-Laurent, les jeunes évoquent divers thèmes qui peuvent être associés à des dimensions du sentiment de pouvoir agir. Ces thèmes contribuent à décrire ce que peut vouloir dire sentir que l'on peut agir face au Saint-Laurent. Ils servent aussi à réfléchir à ce que l'école peut ou ne peut pas faire pour aider les jeunes à gagner un pouvoir d'action. Ils se classent en deux grandes catégories, celle liée aux *libertés de bien-être et d'opportunité* et celle liée aux *libertés de processus et de réalisation*.

5.1 *Libertés de bien-être et d'opportunité*

Le bien-être

Référant au bien-être nécessaire pour sentir que l'on peut agir, divers éléments ressortent des propos d'élèves de quatre équipes. Ces élèves parlent entre autres du *temps* et des *connaissances* qui semblent nécessaires pour agir face à la protection du Saint-Laurent. Une équipe mentionne se sentir parfois impuissante face aux actions à poser. Une autre précise que l'environnement leur tient à cœur, en tant que jeunes. C'est ce qui leur fait dire qu'ils n'ont peut-être pas un pouvoir d'action à eux seuls, mais qu'ils arrivent toutefois à se faire entendre collectivement et cela les fait se sentir bien.

Légitimité des jeunes aux yeux des adultes

Lorsqu'elles parlent de leur sentiment de pouvoir agir, trois équipes soulignent, en lien avec le contexte social dans lequel elles évoluent, le manque de légitimité accordée aux jeunes. À leurs yeux, les jeunes ne bénéficient pas de la même crédibilité et donc de la même écoute que les générations plus âgées : « Parce que quand on est jeune, souvent, on est moins pris au sérieux... Si tu as les mêmes arguments qu'une personne plus vieille, ça peut avoir un impact, mais il y a du monde qui vont se dire : Ok, c'est un *flo*, il ne sait pas de quoi il parle » (É1, Biodiversité et alimentation).

Elles mentionnent toutefois qu'une ouverture de l'entourage à agir ensemble peut les aider à ressentir un pouvoir agir. De même, la présence de modèles d'engagement, entre autres visibles par le biais des médias sociaux, influence leur sentiment face aux problématiques environnementales.

Contextes juridique, économique, matériel et structurel

En lien avec le contexte juridique, une élève explique que la complexité des lois et des règlements contribue à rendre les actions difficiles. Cela ne semble toutefois pas affecter son envie de faire quelque chose pour la protection du Saint-Laurent, mais il s'agit néanmoins d'une dimension à considérer dans le développement de son sentiment de pouvoir agir.

Tu veux faire quelque chose, mais en même temps tu te rends compte que c'est vraiment plus compliqué que ce que tu pensais au début. Mais en même temps, tu n'as pas moins envie de faire quelque chose parce que, même si c'est dur, ça vaut quand même la peine parce que c'est notre fleuve puis c'est le Québec. C'est là où on vit, c'est important (É2, Patrimoine).

L'idée de complexité semble également ressortir comme sous-thème lié au contexte matériel et structurel. En ce sens, deux équipes discutent de la complexité de la gestion des matières résiduelles ainsi que de la complexité structurelle et bureaucratique qui rendent les actions plus ardues. Selon leurs dires, il existe des ressources matérielles durables qui sont plus ou moins accessibles, en fonction des ressources financières dont ils disposent. Par exemple, un jeune se dit prêt à acheter local et sans plastique à usage unique, mais souligne que c'est plus coûteux et donc moins accessible pour les jeunes. Il reconnaît toutefois l'influence que les citoyens peuvent avoir en tant que consommateurs de produits locaux.

Contexte politique

Les extraits liés au contexte politique font ressortir à la fois le pouvoir du citoyen face au gouvernement et le pouvoir qu'exerce le gouvernement face aux citoyens. Une élève mentionne que « c'est important de s'engager parce qu'au fond, la seule chose qui peut faire bouger les choses, c'est que les gens s'impliquent suffisamment puis en nombre suffisant pour que le gouvernement commence à les regarder » (É1, Patrimoine).

Un élève lie, quant à lui, les connaissances nécessaires à la compréhension des enjeux et le pouvoir qui peut s'ensuivre en tant que citoyen. Selon lui, le fait d'être bien au fait des solutions efficaces face à l'érosion des berges peut permettre d'exiger des municipalités (et des grandes compagnies) de meilleures pratiques.

(...) les gens, s'ils ne sont pas informés là-dessus, se disent « Oui, il y a de l'érosion, mais c'est normal ». Puis ils se disent : « Ha! le muret de béton, tant mieux, ça va être correct », mais en vrai ça ne l'était pas... mais ce qui dirige les grandes compagnies, en vrai, c'est la population. Donc, si la population était plus informée, elle se plaindrait aux grandes compagnies puis aux municipalités et c'est là qu'elle pourrait faire quelque chose de différent (É4, Littoral).

Pour un autre élève, un gouvernement qui incite les citoyens à agir face à l'environnement pourrait augmenter leur sentiment de pouvoir agir en les faisant se sentir partie prenante d'une collectivité qui agit : « Si, par exemple, le gouvernement incite les citoyens à le faire, on ne se sent pas tout seul à essayer de faire ça. Donc, si la majorité du Québec essaie de faire ça, on va se sentir comme dans un groupe qui essaie de faire du changement » (É2, Transport).

5.2 Libertés de réalisation et de processus

Actions individuelles et collectives

En lien avec les actions individuelles, deux équipes mentionnent que certaines actions individuelles devraient être réalisées, mais ne le sont pas. Une élève précise qu'elle ne peut pas en faire plus. Une autre équipe dit que certaines personnes ne posent pas ces actions parce qu'elles demandent un effort. Mais généralement, les jeunes soutiennent poser des actions parce que tout le monde doit faire sa part, parce qu'ils ont pris de bonnes habitudes ou parce qu'ils ont été sensibilisés.

Selon les élèves interrogés, diverses raisons font en sorte que les actions collectives à visée de protection environnementale sont non réalisées. Cela peut être parce que certaines personnes ne croient pas aux problèmes environnementaux, parce que cela demande beaucoup de réflexion ou parce que les gens ne savent pas quoi faire. Quelques jeunes soulignent que les générations plus âgées ne seront plus là lorsque des conséquences néfastes surviendront et qu'elles préfèrent ainsi laisser les problèmes aux générations futures. D'autres pensent que c'est parce que cela ne donne rien ou que, pour être efficaces, tout le monde devrait poser ces actions.

Parfois, d'autres raisons poussent les gens à agir face aux problématiques environnementales. En ce sens, deux équipes disent que les gens (ou eux-mêmes) agissent parce qu'on peut le faire collectivement. Les autres équipes mentionnent que c'est parce que c'est important ou normal de le faire. Ils sentent alors que cette action a un impact.

Capacité

Toutes les équipes interrogées reconnaissent que certaines capacités spécifiques peuvent contribuer au développement du sentiment de pouvoir agir. Certaines d'entre elles, telles que l'influence, dépendent malheureusement de la crédibilité qu'on accorde aux jeunes. Le fait de se sentir moins crédibles aurait ainsi un impact sur le sentiment d'être capables d'agir en fonction de ce que l'on considère comme valable. L'argumentation, mais aussi le fait de pouvoir convaincre, influencer et éduquer ressortent comme sous-thèmes liés aux capacités nécessaires au développement du sentiment de pouvoir agir des jeunes. Les efforts, le fait de pouvoir s'inspirer des autres et d'adapter les actions

à mener en fonction de nos moyens à chacun sont aussi nommés comme des capacités nécessaires.

Responsabilité

À la suite de l'analyse des propos des jeunes, nous pouvons dire que, pour sentir que l'on peut agir face à la protection du Saint-Laurent, il faut se sentir responsable, tant de manière individuelle que collective. Il n'en demeure pas moins que certaines personnes semblent avoir d'autres priorités que celles de l'environnement. S'ensuit parfois un déni du problème ou une désresponsabilisation. Pour un élève, les jeunes doivent faire valoir leurs opinions et leurs pensées afin d'éviter que les générations plus âgées entretiennent l'idée que les prochaines générations vont s'occuper de ces problèmes : « Il y a une phrase qui dit, "on n'est pas juste le futur, on est les acteurs d'aujourd'hui". Les jeunes, nous aussi, on a notre part à jouer là-dedans : de faire valoir nos opinions et nos pensées » (É1, Biodiversité et alimentation).

Attentes de résultats

Afin de sentir que l'on peut agir, les résultats sont importants. Cependant, trois équipes semblent avoir de la difficulté à sentir que leurs actions donnent des résultats. D'autres disent avoir de la difficulté à anticiper les résultats de leurs actions. Une rhétorique d'accumulation des gestes ou des personnes qui posent les gestes semble également présente dans leurs propos. Les jeunes se rassurent sur l'impact des gestes posés en pensant que d'autres posent aussi ces gestes. D'autres jeunes se disent toutefois conscients de l'impact des actions individuelles posées. Ils sont capables de nommer des exemples de réussites et d'engagement. Une équipe dit éprouver du plaisir et de la satisfaction face à l'engagement et à l'action environnementale.

Appréciation de la démarche

Au terme de la démarche, les élèves nous confient avoir vécu des activités assez différentes de celles qu'ils réalisent habituellement à l'école. Selon leurs dires, d'être plus libres et de pouvoir effectuer des choix a rendu le tout plus agréable et moins angoissant. La « forme scolaire » (Vincent, 1994) dominante tend effectivement à faire obstacle à la mise en œuvre d'activités au cours desquelles les élèves peuvent faire preuve d'autonomie et de créativité. L'idée que nous entretenions en élaborant la démarche était de considérer les jeunes comme des interlocuteurs valables et de leur accorder une plus grande confiance dans la structuration de leurs apprentissages. Les élèves auraient toutefois aimé pouvoir passer plus de temps sur le projet, entre autres pour approfondir leur documentation, mais également pour pouvoir profiter des recherches des autres équipes.

6. *Interprétation et pistes pour inspirer une connaissance de l'océan pour tous*

De manière générale, les élèves interrogés en fin de démarche demandent davantage de projets comme celui-ci, liés à leur environnement, au sein de leur école. Ils souhaiteraient que ces projets stimulent leur engagement. Ils aimeraient que l'on traite davantage, à l'école, de *l'ici et du maintenant*, plutôt que de *l'ailleurs et du passé*. Les sorties en nature sont appréciées par les jeunes et ils y voient de grands bénéfices. Pour contribuer à l'engagement des jeunes en environnement, il est effectivement important de favoriser le développement d'un lien affectif étroit avec la nature (Chawla et Cushing, 2007) et d'inviter les jeunes à participer à des efforts collectifs dans leur communauté (Hayward, 2012). Nous aurions d'ailleurs souhaité développer davantage ce dernier aspect dans la démarche éducative.

Comme illustré par Jeziorski et Therriault (2019), le Saint-Laurent revêt, pour les jeunes Bas-Laurentiens, une importance affective marquée. Certains mentionnent qu'il fait partie de leur identité et qu'ils ont de la difficulté à imaginer une existence sans lui. Considérant ce qui précède, il est décevant que certains apprentissages significatifs en lien avec le Saint-Laurent arrivent si tardivement dans leur parcours. À titre d'exemple, que les élèves comprennent le lien entre l'achat local et le transport maritime seulement à la suite de ce projet nous apparaît étonnant. De plus, il nous semble incroyable que des jeunes de 16 ans disent ne pas avoir déjà réalisé des activités d'apprentissage sur le Saint-Laurent, du moins assez significatives pour qu'ils s'en souviennent. Une éducation à l'océan qui considère les enjeux réels, locaux et actuels du Saint-Laurent nous apparaît donc plus que justifiée. Les programmes déjà très chargés, le peu de liberté, de temps, de formation, de reconnaissance et de ressources accordés aux enseignants et, de manière plus générale, aux écoles, constituent toutefois de grandes barrières à une telle éducation.

Les thèmes émergeant de l'analyse et qui sont directement liés aux intérêts des élèves pourraient inspirer ce que l'on entend par une éducation à l'océan pour tous. Celle-ci devrait également être orientée vers le développement d'un fort sentiment de pouvoir agir des jeunes au regard des enjeux environnementaux associés à un cours d'eau d'importance et près d'eux. Pour y arriver, il serait tout à fait pertinent de s'inspirer des résultats de l'analyse effectuée et de considérer les diverses dimensions de leur sentiment de pouvoir agir. Le fardeau de la responsabilité des problèmes environnementaux pèse déjà lourd sur les épaules des jeunes et ceux-ci n'ont pas nécessairement toutes les capacités nécessaires pour y faire face dans l'immédiat. L'école se doit donc d'être un milieu où les jeunes développent de telles capacités et en viennent à ressentir un grand pouvoir d'agir. Il est aussi impératif que les jeunes soient considérés comme des interlocuteurs valables au sein de leur communauté et ainsi qu'ils puissent jouir d'une plus grande légitimité. Cela pourrait entre autres passer par l'école, qui devrait contribuer à multiplier les occasions où l'on porte la voix des jeunes sur les questions environnementales qui les concernent, tout en leur accordant confiance et de liberté.

Notes

- ¹ Projet piloté par Barbara Bader et Jean-Marc Lange, Éducation interculturelle à l'environnement et au développement durable (EIEDD) : Rapports aux savoirs scientifiques et aux territoires et engagement écocitoyen de jeunes de la fin du secondaire en France et au Québec, Subvention de l'Agence nationale de la recherche (ANR) en France et du Fonds de recherche du Québec - Société et culture (FRQSC).
- ² Toutes les considérations éthiques liées à cette recherche ont été prises en compte et respectées. Un certificat a été obtenu de la part du Comité d'éthique de la recherche de l'Université Laval (2016-343 A-1 R-1/11-10-2018).

Références

- Archambault, P., Schloss, I. R., Grant, C. et Plante, S. (2017). *Les hydrocarbures dans le golfe du Saint-Laurent – Enjeux sociaux, économiques et environnementaux*. Notre Golfe. Université du Québec à Rimouski. <https://notregolfe.ca/#livre>
- Bader, B., Therriault, G. et Morin, É. (2017). Engagement écocitoyen, engagement scolaire et rapport aux savoirs. Dans L. Sauvé, I. Orellana, C. Villemagne et B. Bader (dir.), *Éducation, Environnement, Écocitoyenneté*. Repères contemporains (p. 81-100). Presses de l'Université du Québec.
- Bandura, A. (2003). *Auto-efficacité. Le sentiment d'efficacité personnelle* (traduit par J. Lecompte). De Boeck Université.
- Bourgault-Faucher, G. (2020) *L'économie des pêches au Québec : analyse et propositions pour favoriser la commercialisation des produits de la mer du Québec sur le marché domestique*. Réseau Québec maritime. <https://irec.quebec/ressources/publications/Leconomie-des-peches-au-Quebec-version-retravaillée-pour-le-site-de-IIREC.pdf>
- Charlot, B., Bautier, É. et Rochex, J.-Y. (1992). *École et savoirs dans les banlieues et ailleurs*. Armand Colin.
- Chawla, L. et Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research*, 13(4), 437-452. <https://doi.org/10.1080/13504620701581539>
- Comim, F., Ballet, J., Biggeri, M. et Iervese, V. (2011). Introduction – Theoretical foundations and the book's roadmap. Dans M. Biggeri, J. Ballet et F. Comim (dir.), *Children and the Capability Approach* (p. 3-21). Palgrave Macmillan. <https://doi.org/10.1057/9780230308374>
- Delamatta, A. (2020). *Participant observation of an interdisciplinary educational innovation project on the Saint Lawrence River in a Grade 11 class in Quebec City* [mémoire de maîtrise, Université Laval]. CorpusUL. <https://corpus.ulaval.ca/jspui/bitstream/20.500.11794/665771/36122.pdf>
- Didier, D., Baudry, J., Bernatchez, P., Dumont, D., Sadegh, M., Bismuth, E., Bandet, M., Lambert, A., Dugas, S. et Sévigny, C. (2018). Multihazard simulation for coastal flood mapping: Bathub versus numerical modelling in an open estuary, Eastern Canada. *Journal of Flood Risk Management*, 12(Suppl. 1), e12505. <https://doi.org/10.1111/jfr3.12505>

- Elshof, L. (2010). Transcending the age of stupid: Learning to imagine ourselves differently. *Canadian Journal of Science, Mathematics and Technology Education*, 10(3), 232-243. <https://doi.org/10.1080/14926156.2010.504483>
- Fauville, G. (2017). Questions as indicators of ocean literacy: students' online asynchronous discussion with a marine scientist. *International Journal of Science Education*, 39(16), 2151-2170. <https://doi.org/10.1080/09500693.2017.1365184>
- Glithero, L. (2020, juin). *Comprendre la connaissance de l'océan au Canada : Rapport national*. Coalition canadienne de la connaissance de l'océan. https://colcoalition.ca/fr/wp-content/uploads/2020/07/CCCO_Rapport-national_FR.pdf
- Glithero, E. (2015). *Exploring the development of student agency from the perspectives of young Canadian eco-civic leaders* [thèse de doctorat, Université d'Ottawa]. Recherche uO. https://ruor.uottawa.ca/bitstream/10393/32335/1/Glithero_Elizabeth_2015_thesis.pdf
- Hayward, B. (2012). *Children, citizenship and environment: Nurturing a democratic imagination in a changing world*. Earthscan/Routledge.
- Ibrahim, S. et Alkire, S. (2007, mai). *Agency and empowerment: A proposal for internationally comparable indicators* [document de travail]. <https://ophi.org.uk/wp-content/uploads/OPHI-wp04.pdf>
- Jeziorski, A. et Therriault, G. (2019). Students' relationships to knowledges, place identity and agency concerning the St. Lawrence River. *Journal of Curriculum Studies*, 51(1), 21-42. <https://doi.org/10.1080/00220272.2018.1542030>
- Jickling, B. et Wals, A. E. J. (2013). Probing normative research in environmental education. Dans R. B. Stevenson, M. Brody, J. Dillon et A. E. J. Wals (dir.), *International Handbook of research on environmental education* (p. 74-86). Routledge. <https://doi.org/10.4324/9780203815331>
- Kelsey, E. et Armstrong, C. (2012). Finding hope in a world of environmental catastrophe. Dans A. E. J. Wals et P. Blaze Corcoran (dir.), *Learning for sustainability in times of accelerating change* (p. 187-200). Wageningen Academic Publishers. <https://doi.org/10.3920/978-90-8686-757-8>
- Kenis, A. et Mathijs, E. (2012). Beyond individual behaviour change: The role of power, knowledge and strategy in tackling climate change. *Environmental Education Research*, 18(1), 45-65. <https://doi.org/10.1080/13504622.2011.576315>
- Ministère des Transports (2009). *Le transport des marchandises sur le Saint-Laurent depuis 1995*. Gouvernement du Québec. https://www.bibliotheque.assnat.qc.ca/DepotNumerique_v2/AffichageNotice.aspx?idn=30725
- Morin, É., Therriault, G. et Bader, B. (2019). Le développement du pouvoir agir, l'agentivité et le sentiment d'efficacité personnelle des jeunes face aux problématiques sociales et environnementales : apports conceptuels pour un agir ensemble. *Éducation et socialisation*. 51. <http://journals.openedition.org/edsos/5821>
- Ministère des pêches et des océans du Canada (MPO) (2007). *Zones d'importance écologique et biologique (ZIEB) de l'estuaire et du golfe du Saint-Laurent : identification et caractérisation* (publication n° 1919-51172007/016). Secrétariat canadien de consultation scientifique. <http://publications.gc.ca/site/fra/9.601385/publication.html>
- Paillé, P. et Mucchielli, A. (dir.). (2016). *L'analyse qualitative en sciences humaines et sociales* (4^e éd.). Armand Colin Éditeur.

- Sadler, T. D., Barab, S. A. et Scott, B. (2007). What do students gain by engaging in socioscientific inquiry? *Research in Science Education*, 37(4), 371-391. <https://doi.org/10.1007/s11165-006-9030-9>
- Sen, A. K. (2010). *L'idée de justice* (traduit par P. Chemla). Flammarion.
- Therriault, G., Jeziorski, A., Bader, B. et Morin, É. (2018). Étude croisée du rapport aux savoirs à l'égard des sciences naturelles et des sciences humaines et sociales : portraits d'élèves de la fin du secondaire au Québec. *Recherches en éducation*, 32(mars 2018), 192-208. <https://crires.ulaval.ca/work/3064>
- UNESCO (2017). *L'éducation en vue des objectifs de développement durable. Objectifs d'apprentissage*. <https://unesdoc.unesco.org/ark:/48223/pf0000247507>
- Vincent, G. (dir.). (1994). *L'éducation prisonnière de la forme scolaire? Scolarisation et socialisation dans les sociétés industrielles*. Presses Universitaires de Lyon.
- Zeyer, A. et Kelsey, E. (2013). Environmental education in a cultural context. Dans R. B. Stevenson, M. Brody, J. Dillon et A. E. J. Wals (dir.), *International Handbook of research on environmental education* (p. 206-212). Routledge. <https://doi.org/10.4324/9780203813331>

Can Ocean Literacy Save Our Coastal School?

Noémie Roy, Marine Affairs Program, Dalhousie University

Abstract

Protecting coastal ecosystems and communities requires the engagement of ocean literate citizens. Along the St. Lawrence Estuary, in Canada, a rural community mobilized to save its middle school by creating an innovative program connecting the existing curriculum to the ocean. This research explores the rationale, barriers, and enablers of including ocean literacy in schools through a case study of this program. Interviews and surveys with school community members showed that although the school managed to stay open, the program faces considerable barriers, including the lack of an educational framework, educational resources, and funding. Support from community members and access to a coordinator were the program's greatest enablers. From these findings, I develop recommendations to support the establishment of similar programs in other schools.

Résumé

La protection des communautés et écosystèmes côtiers nécessite l'engagement de citoyens sensibilisés aux enjeux océaniques. Sur les bords de l'estuaire du Saint-Laurent, au Canada, une communauté rurale s'est mobilisée pour sauver son école en créant un programme novateur qui intègre l'océan au programme scolaire des élèves du début du secondaire. La présente étude de cas explore les fondements, les obstacles et les facteurs facilitants de l'intégration de la connaissance de l'océan dans les écoles. Les entrevues et sondages réalisés auprès des acteurs du milieu scolaire ont montré que, bien que l'école soit restée ouverte, le programme a dû surmonter plusieurs obstacles, dont le manque d'un cadre éducatif, de ressources pédagogiques et de financement. Le soutien des membres de la communauté et l'accès à un coordonnateur ont été les facteurs facilitants les plus importants. Ces conclusions ont permis de formuler des recommandations pour appuyer l'établissement de programmes semblables dans d'autres écoles.

Keywords: ocean literacy, coastal communities, formal education, case study, Quebec

Mots-clés : connaissance de l'océan, éducation relative à l'océan, communautés côtières, éducation formelle, étude de cas, Québec

Introduction

As coastal ecosystems are influenced by both inland and marine human activities, their sustainable development requires in-depth understanding of the human impacts on the ocean and in turn, the impacts of the ocean on us

(Crain et al., 2009). In the sustainable development literature, many papers call for “more education,” especially more environmental (e.g., Österblom et al., 2020) or marine education (Gough, 2017; McKinley & Fletcher, 2012; Schoedinger et al., 2006). Marine education can develop ocean literacy, most often defined as an understanding of “the ocean’s influence on us and our influence on the ocean” (Santoro et al., 2017, p. 15). Ocean literacy matters for the management of coastal ecosystems, as ocean literate citizens are empowered with the ability to make responsible decisions regarding ocean resources (Santoro et al., 2017).

Responding to calls for “more marine education” is a very complex undertaking. While calls for more ocean literacy often originate at the international or national levels, education is managed at the provincial and local levels. In Canada, marine education falls in a jurisdictional gap. In fact, the dynamic and interconnected nature of the ocean continuum (land, water, coasts, sea ice, open ocean, as defined by Glithero, 2020) itself defies jurisdictional boundaries and zones, much like education. On the one hand, ocean management is primarily the responsibility of the Department of Fisheries and Oceans Canada (DFO). The DFO has neither an educational mandate nor extensive funds for education. On the other hand, the Quebec Ministry of Education affirms that environmental issues do not concern its sector (Sauvé et al., 2018). As a result, there are currently little to no ocean-related concepts in Quebec’s kindergarten to Grade 12 curricula (Quebec Ministry of Education, 2006; Quebec Ministry of Education, n.d.). Teachers across Canada struggle to include ocean concepts in their classroom because they face barriers such as lack of time and resources (McPherson et al., 2020). This is especially true of teachers in rural regions, where financial, human, and material resources are even scarcer (Arena et al., 2009).

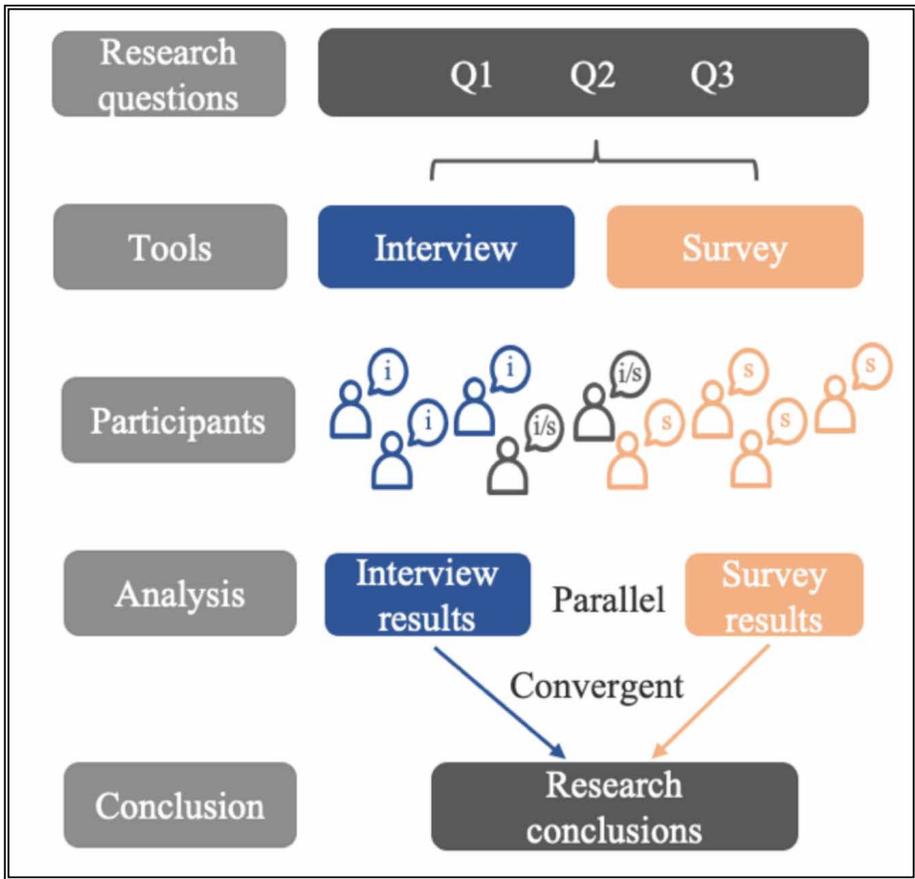
On the shores of the St. Lawrence Estuary, in Quebec, a small middle school (25–30 students) managed to bring the ocean into their classrooms using a unique community-based approach. The school community is deeply attached to their school and to the sea, which can be seen, heard, and smelled from almost everywhere in the community. Like many small coastal communities, the future of this town is increasingly uncertain. From 2011 to 2016, the population declined by 2.6% (Statistics Canada, 2016). In 2016, the school board threatened to close this community’s middle school. To save their school, community members created a program through which students learn about the ocean in all school subjects. The program is called *Le Saint-Laurent dans ma classe*, or “The St. Lawrence in my classroom” (pseudonym). Teachers follow Quebec’s Grade 7 and 8 curriculum but apply it through an oceanic lens. For instance, students learn to scuba dive in their physical education class, read about phytoplankton in their French class, and study plastic pollution in their geography class.

Initially, I selected this unique program as a case study of the influence of ocean literacy in formal school settings on the students and school community (parents, teachers, administrators, and community partners). However, in

conducting this research, an unexpected narrative emerged. While the school community was keen to increase ocean education (they did not use the term ocean literacy or its French equivalent, *connaissance de l'océan*), their primary goal was to save their school and increase the resilience of their small coastal town. The reality of this precarious school community suggests that implementing calls for more marine education comes with many challenges. The purpose of this case study is to gain a more granular understanding of the complexity of implementing ocean literacy in the school system, and to inform educators and policy makers seeking to implement such initiatives. To achieve this purpose, I aim to answer the following research question: “How can formal education foster ocean literacy in coastal school communities?” By formal education, I refer to education in schools through institutionalized education (UNESCO Institute for Statistics, 2012). I answer this research question by exploring the program *Le Saint-Laurent dans ma classe* through the following sub-questions: “What are the barriers associated with the implementation and sustainability of this program?” and “What are the enablers associated with the implementation and sustainability of this program?”

Methodology

This research is a case study of the program *Le Saint-Laurent dans ma classe*. More specifically, I look at the creation and the first three years of implementation of the program (2017/2018, 2018/2019, 2019/2020). A case study methodology has the potential to provide in-depth analyses and concrete examples of how calls for more ocean education can be implemented in a complex jurisdictional context. This research can be classified as an explanatory case study (Yin, 2014). This type of case study facilitates the explanation of particular phenomena or events (Yin, 2014), in this case, the events leading to the integration of ocean literacy into formal education. To complete this case study, I used a mixed-method approach, combining semi-structured interviews and a survey. A mixed methodology combines strengths from both quantitative and qualitative methodologies (Greene et al., 1989). Each research question required multiple perspectives in order to be answered and was therefore addressed using both interviews and a survey (Figure 1). For instance, the survey afforded the opportunity to ask participants whether they thought factors that had been identified in the literature (Glithero & Zandvliet, 2020; Gough, 2017; Lambert & Sunburg, 2006; McPherson et al., 2020; Stewart, 2019) were barriers, enablers, or neither to the delivery of the program. In the interviews, participants were asked to name barriers and enablers without being provided with a list of factors. The survey allowed me to test if the barriers and enablers experienced within this program are the same as the ones described in the literature, while the interviews allowed participants to share other barriers and enablers without being influenced by a list of pre-selected factors.



Note. Q1, Q2, Q3 refer to my three research questions. This figure shows that I answered all three questions using both interviews and a survey. Participant icons identified by an “i” represent participants to interviews only (n = 3). Participant icons identified by an “s” represent participants to the survey only (n = 4). Participant icons identified by “i/s” represent participants in both methods (n = 2). Icons adapted from Flaticon (<https://www.flaticon.com/>).

Figure 1. Conceptual Representation of the Study Design

The study population included all adults who are or have been involved in the program *Le Saint-Laurent dans ma classe*. This included parents of current or past students in the program, all current or past members of the school staff since 2017, all current or past members of the governing board since 2017, and any community member involved in the program. I contacted participants by email. I had five interview participants: one current teacher, one past teacher, two members of the governing board of the school, and one involved community member. Interviews took place from May to July 2020.

I audio-recorded and then transcribed each interview. I conducted a thematic analysis of the interviews in French, their original language, using NVivo12. The interview process was complemented by an online survey. I built the survey in French, on the online platform Opinio. It was pre-tested by five people. In total, six people completed the survey, including two participants from the interviews. One of the six survey participants completed the entire survey with the exception of one question. The survey was open from May 24 to June 8, 2020. As only a small number of participants responded, I analyzed survey results descriptively rather than statistically.

This mixed methodology was conducted in a convergent parallel design, meaning that I analyzed interview results independently from survey results (Halcomb & Hickman, 2015). I used this design to obtain two complementary datasets for each research question. The convergent parallel design allowed me to give equal priority to both research methods (Halcomb & Hickman, 2015). This methodology was approved by the Marine Affairs Program Ethics Review Standing Committee in April 2020 (MAPERSC #: MAP2020-01).

The COVID-19 pandemic led to some limitations. The greatest impact was on recruiting study participants, since not being able to travel to the community reduced my ability to meet directly with community members, parents, teachers, and school staff. In addition, schools were in turmoil in the spring of 2020, with school closures directly limiting participant availability to participate in my study. Fortunately, I was able to connect with participants from the four identified populations (school staff, parents, governing board members, and community members) to provide a range of perspectives on the project. Since I was conducting a small case study, focusing on only one program at one school, the validity of my method depended on the depth of the information I collected rather than on the amount of information. Therefore, the low numbers of participants do not invalidate my findings. Another limitation linked to the pandemic was that I was not able to collect in-person data for this project. Being physically in the environment where the program takes place would have allowed me to observe how students engage with the program, for instance, through artwork or other projects displayed at the school.

Furthermore, I did not include students as study participants. Involving youth would have required a different research approach in order to ethically engage them in the research. The new sociology of childhood recognizes children as active agents in the research rather than solely as research objects (Kirk, 2007). When conducting research on children, Green and Hill (2005) recommend engaging children in every step of the research process. Properly undertaking such an approach takes time, especially to address concerns in research with children, such as power relations, informed consent, and confidentiality (Kirk, 2007). For instance, children participating in research may not be used to disagreeing with adults (Hill, 2005) or may feel as if they have less power than adults (Freeman & Mathison, 2008). I chose not to engage with students rather than engaging

with them in a superficial and possibly unethical way. However, this is a notable research gap as students are a central part of the school community and I hope future research can include their voices and perspectives.

Results

In this section, I present the context surrounding the creation of the program *Le Saint-Laurent dans ma classe* and its first three years of implementation (2017/2018 to 2019/2020). Then, I present in more detail the barriers and enablers of the program, first by exploring the interview results, second by analyzing the survey results, and third by combining the results of both methods. By combining the results, I provide an overarching view of how the data answer the research questions.

Context of the Case Study

The St. Lawrence middle school has the St. Lawrence Estuary in its backyard and many marine researchers, fishers, and storytellers in its community. In this context, *Le Saint-Laurent dans ma classe* becomes an opportunity for intergenerational connections and place-based education within the community. Place-based education roots the learning process in the local context (Sobel, 2004). Students learn about many topics throughout the year, several of which directly affect their community. For instance, they learn about marine plastics, marine mammals, and marine careers, and they meet with local experts on these topics. As the students interact with community members, they begin to develop their ocean citizenship and become ambassadors of the sea in their community.

Initially the program was successful, resulting in the school board deciding not to close the school. However, the school is still in a precarious situation. Only 29 students registered for the 2020/2021 school year. The principal is managing two elementary schools in addition to the St. Lawrence middle school without the help of a vice-principal. Only three teachers out of seven work full-time at this school. Additionally, high staff turnover and low funding availability make managing a long-term program such as *Le Saint-Laurent dans ma classe* difficult. Unfortunately, like many school change initiatives (Askell-Williams & Koh, 2020), the program created a lot of enthusiasm at the outset, but rapidly lost momentum over the years (Figure 2). A consultant in marine education helped create and implement the program in the first year. This consultant brought a lot of ideas and energy into the program. However, lack of funding prevented the school from rehiring this consultant in the following years. Then, a change of teachers and a new principal made it difficult to keep the program going. Finally, the COVID-19 pandemic stopped the school from doing any program activities in the last months of the 2019/2020 school year.

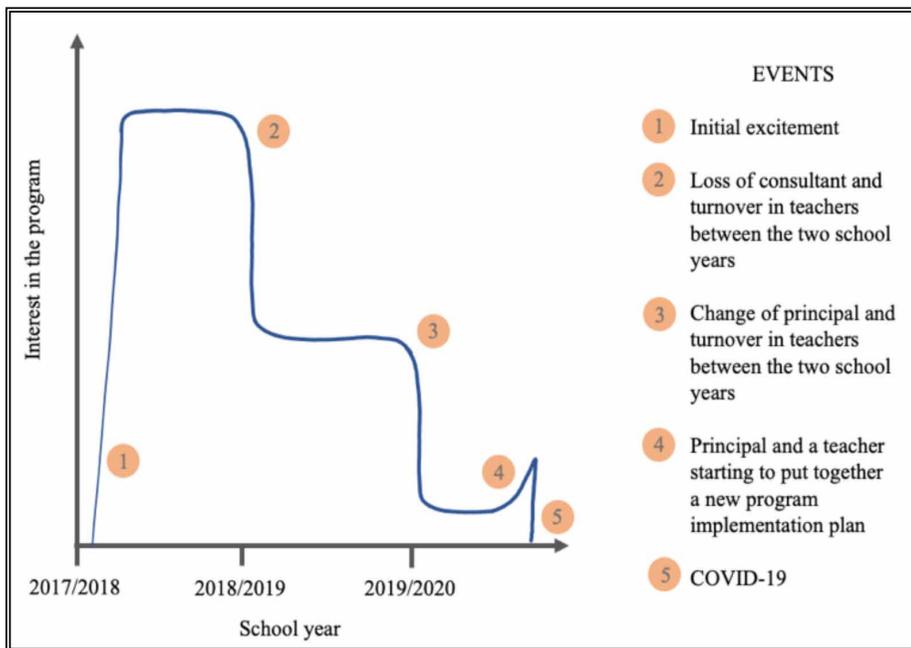


Figure 2. Variation in the Interest in the Program Over the First Three Years

Challenges such as lack of funding, staff turnover, and educational resources are common in rural schools in Quebec (Arena et al., 2009). As Arena et al. (2009) explain, in Quebec's remote regions, populations tend to decrease, leading to a decrease of students in schools. As schools are funded based on their size, schools with fewer students receive less funding. Therefore, these schools have to teach with less equipment, supplies, and staff resources (Arena et al., 2009). Moreover, many non-formal education resources, such as museums, aquariums, and educational centres, are located in urban areas and are difficult for schools outside these areas to access. For rural schools, visiting these locations requires full-day field trips, expensive transportation, and funding.

Barriers to the Program

Through the interviews and surveys, I explored in more detail the barriers leading to a decrease of interest in the program.

Results from the interviews. During the interviews, I asked participants to identify the main barriers to the implementation and sustainability of the program. Lack of support for the program, turnover in staff, and work overload were the three most frequently identified barriers. The COVID-19 pandemic was also mentioned as a barrier.

i. Lack of support. Not rehiring the consultant after the first year of the program meant that teachers were asked to prepare all program activities. Teachers who were present in the first year of the program compiled activities in a folder so that these could be reused by future teachers. However, such a folder does not replace a skilled consultant with extensive community contacts and expert knowledge. Another challenge associated with losing the consultant was that the program now lacked coordination. As one teacher put it, “Everybody thinks that someone else will do it [organizing activities] and in the end no one does it.”¹ Because of this dynamic, teachers organized significantly fewer activities in the second and third years of the program than they did in the first year (Figure 2).

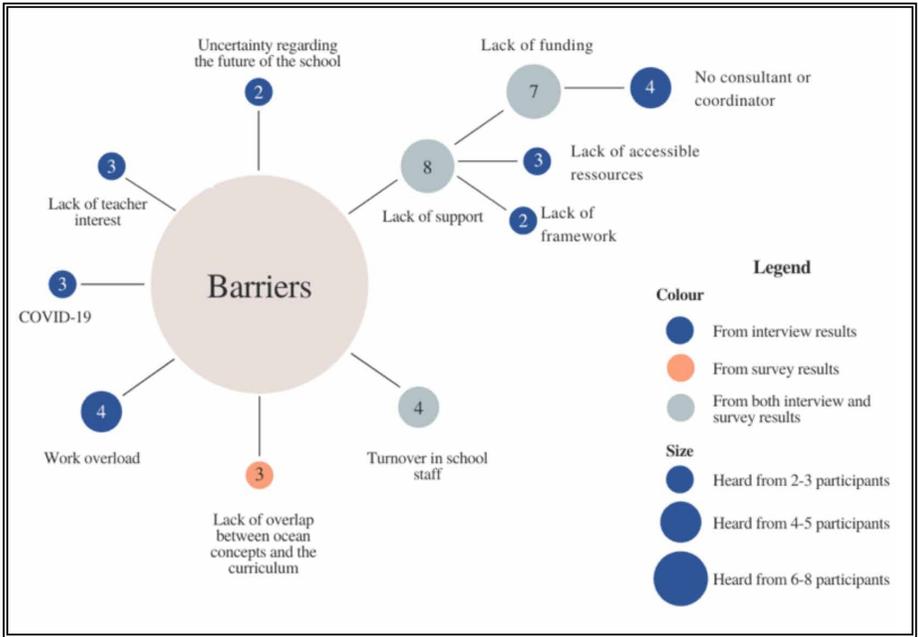
ii. High turnover in staff. The interviews also identified the turnover in school staff as a barrier. The program was implemented in 2017/2018 with a team of seven teachers and one principal. All teachers but one were replaced for the 2018/2019 school year. Before the start of the 2019/2020 school year, the principal retired and four teachers were replaced, including the only teacher left who had experienced the first year of the program. Finally, for the 2020/2021 school year, four teachers were again replaced.

Turnover in teachers impacts program momentum and leads to varied interest in the program from one year to the next. A successful activity is difficult to repeat without the teacher who initiated it, as its delivery often depends on the teacher’s interests and relationships. Turnover in teachers also makes it hard to plan for the following school year. Elementary, middle, and high school teachers in Quebec only learn in July whether they will be teaching at the same school the following September. As one participant explained, “There is so much movement in the personnel that no one plans the following school year [in advance] because it will not necessarily be the same team redoing it in August.”²

iii. Work overload. Participants expressed that teachers and the school principal struggled with the addition of program responsibilities to their regular responsibilities, as well as the difficulty of finding ocean education resources. As many teachers at this school teach in multiple schools, they have a lot to manage. The barrier of work overload relates to the barrier of a lack of support. The teachers I interviewed felt that the lack of a framework and the lack of help to find resources contribute to why they feel overwhelmed.

iv. The COVID-19 pandemic. Participants mentioned the COVID-19 pandemic as a barrier. From March 2020 to the end of the school year in June, the school was closed and students were learning from home. Because of the challenges of remote teaching (e.g., adapting courses to the online environment, being able to meaningfully connect with students through technology) and the general context of uncertainty, no activities related to the program were completed during this period. In fall 2020, the school reopened. The teachers had planned to start the year with a whale watching expedition. However, as field trips were prohibited in the fall 2020, they pushed this expedition to the end of the 2020/2021 school year.

Results from the survey. The survey also allowed barriers to the program to be identified. From the list of factors presented to survey participants, two stood out as barriers: lack of funding and lack of overlap between ocean concepts and the provincial curriculum. I did not include the factor of turnover in teachers in the list, but a survey participant suggested it as an additional barrier.³



Note. The numbers in the bubbles indicate the total number of interview participants that identified this factor as a barrier to the implementation and sustainability of the program plus the total number of survey participants that indicated this factor was “always a barrier” or “sometimes a barrier,” or identified the factor as a barrier in the comment section of the survey. If a participant identified a factor as a barrier in both the survey and the interview, I only counted it once.

Figure 3. Barriers to the Implementation and Sustainability of the Program Le Saint-Laurent dans ma classe

Figure 3 combines the results from the interviews and the survey on the barriers to the program. As shown in the figure, lack of support was the greatest barrier to the program. Lack of funding, which falls under lack of support, was also particularly important as it prevented the consultant from being rehired.

Enablers of the Program

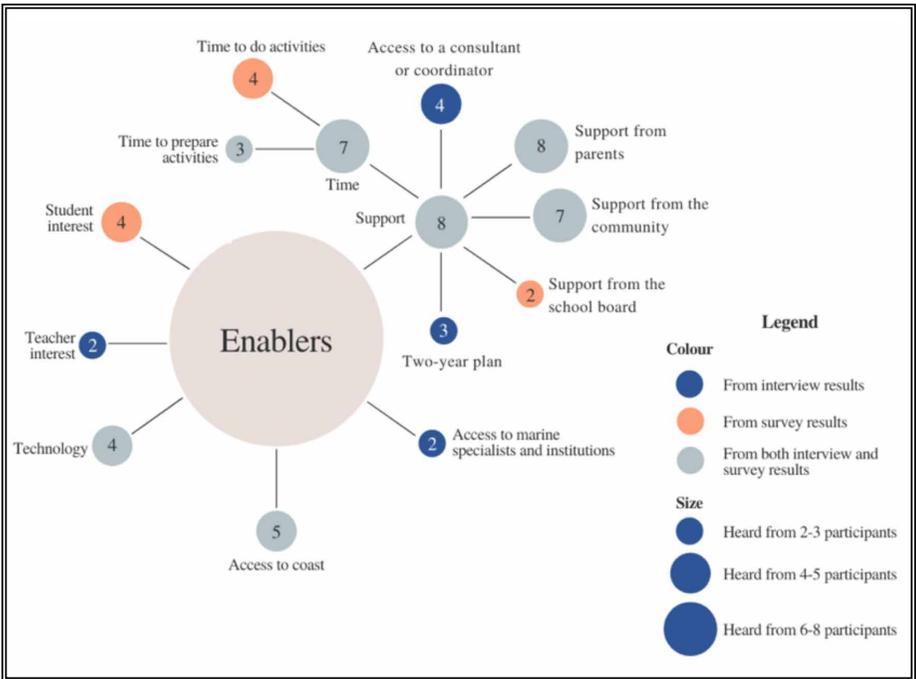
Even though the program faced many barriers, it also benefitted from enablers. Both interview and survey participants identified enablers of the implementation and sustainability of the program.

Results from the interviews. Participants discussed what enablers of the program were important in the past, important in the present, or could be important in the future. In the past, having the help of a consultant enabled the school to implement the program. In the present, having the support of a motivated team of parents and school community members, and having many specialists and marine institutions close by supported the implementation and sustainability of the program. In the future, the school is planning to implement a two-year plan with fixed activities and themes. They hope that this plan will increase the program's sustainability.

i. Past enablers. The consultant's experience in, and holistic vision of, the marine field in Quebec allowed students to benefit from activities that would not have been possible otherwise. A participant gave some examples of activities organized by this consultant: "It was always passionate people. [...] We had at one point a writer, who told us his story. The children did scuba diving. It never stop[ped]."⁴ Teachers often feel that they lack the skills and knowledge to share complex (McPherson et al., 2020) or controversial (Payne & Zimmerman, 2010) ocean concepts with their class, such as waste management or political commitments to climate justice. A consultant can support teachers in addressing these topics.

ii. Present enablers. Parents and school community members first initiated the program and have continuously supported it. As one participant said, parents and school community members allowed the program "to stay on course so that transitions happen with great motivation."⁵ Some of them are part of the school governing board, to which the school has to periodically report on the state of the program. Moreover, many school community members volunteered to come to the school and share their knowledge and passion. As many of these people are marine researchers, storytellers, fishers, or members of the coast guard, this is an "invaluable resource."⁶

The region around the school is home to many marine research institutions and marine industries—some of the main economic sectors in the region. Teachers hope the program increases the career literacy of the students and encourages them to stay in the community as adults. Retaining youth is imperative for the resilience of this small community. The proximity of these institutions and industries to the school creates affordable opportunities for the school to invite presenters and visit marine research centres and infrastructure. The affordability of these opportunities increases the likelihood of having access to these activities in the long-term and allows the school to build these activities into a two-year plan.



Note. The numbers in the bubbles indicate the total number of interview participants that identified this factor as an enabler to the implementation and sustainability of the program plus the total number of survey participants that indicated this factor was “always an enabler” or “sometimes an enabler,” or identified the factor as an enabler in the comment section of the survey. If a participant identified a factor as an enabler in both the survey and the interview, I only counted it once.

Figure 4. Enablers of the Implementation and Sustainability of the Program *Le Saint-Laurent dans ma classe*

iii. Possible enablers in the future. The principal and a teacher developed a two-year plan in early 2020 (Figure 2) and implemented it in September 2020. The plan provides teachers with a framework with four themes per year (eight themes in total) and fixed activities. It also identifies a local expert for each theme who would come to the school every two years to give a presentation. This two-year plan makes the program delivery simpler for teachers as they now have a framework to rely on and do not have the responsibility of finding and inviting local experts.

Results from the survey. The factors identified as enablers in the survey were similar to the enablers from the interviews. Survey participants highlighted support from parents and the school community as enablers. Access to the coast was identified as “always an enabler” by four survey participants. Additionally, survey participants identified time to create activities and student interest as enablers.

Survey participants added two factors as enablers that did not appear in the list in the survey: One participant indicated collaboration between colleagues as “always an enabler”; another participant indicated support from the school principal as “sometimes an enabler.”

Figure 4 combines the enablers identified by interview and survey participants. Interestingly, I identified lack of support as the main barrier to the program (Figure 3) and support as the main enabler of the program. Support from parents, the community, and time to prepare and conduct activities all act as program enablers.

Discussion

Many of the barriers and enablers presented above relate to literature on environmental and marine education. In this section, I expand on these barriers and enablers to develop recommendations for other schools wishing to establish similar programs.

Barriers to the Program

Since its inception only three years ago, the program *Le Saint-Laurent dans ma classe* has faced many barriers. These barriers are similar to the ones met by other schools trying to deliver environmental education programs. McPherson et al. (2020) interviewed high school science teachers in Nova Scotia about the challenges of integrating ocean science into their courses. The teachers identified an overloaded curriculum, lack of educational resources, and lack of time as barriers. Teachers said that as long as ocean concepts are not included in the curriculum, they are likely to remain marginalized. Finding creative ways to integrate ocean content with the current curriculum content is possible, but only to a certain extent.

Another major barrier identified at the St. Lawrence middle school was turnover in staff, which comes with significant costs. Barnes et al. (2007) found that in the United States, at the time of their study, replacing a teacher could cost from USD 9,000 to 20,000. These costs were for recruitment, hiring, and training. The barrier of turnover in staff can therefore be linked to that of lack of funding. In addition to monetary costs, turnover can have an impact on the students, who have been shown to suffer from a decrease in teaching quality (Carver-Thomas & Darling-Hammond, 2017). The difficulty in filling teaching positions can lead to teachers being hired right before the start of a new school year, leaving little time for planning and program preparation. There is also a risk of teachers with inadequate training being hired to fill empty positions (Carver-Thomas & Darling-Hammond, 2017).

The St. Lawrence middle school may have to bring teachers from outside the area to replace teachers who have left. It is likely that it would take time

for teachers who are new to the area to establish deep relationships with the community and understand its history, challenges, and connection with the ocean. The program *Le Saint-Laurent dans ma classe* is anchored in the local context, and relationships with the community are at the heart of place-based education (Leather & Nicholls, 2016). Teachers need to understand the lived experience of the students to adequately support them in their transition from elementary to high school—a period of high emotional, social, and behavioural change (Longobardi et al., 2016). If teachers are constantly changing, they may not have the time to establish the meaningful relationships needed to deliver the program and fully support their students.

Enablers of the Program

Since the creation of the program, the St. Lawrence middle school has relied heavily on the support of the school community. According to Arena et al. (2009), educational programs that engage with the local community are key to the economic and social viability of rural communities in Quebec. Partnerships with the local community allow the exchange of knowledge between the students, teachers, and the local community. Uzzell (1999) describes four types of school-community partnerships: school as an isolated island, local community invited into school, school as a guest in the community, and school as a social agent. When the school acts as a social agent, students collaborate with the community to address local environmental issues. This type of partnership is likely the most effective at helping the students become agents of change (Uzzell, 1999).

In the program *Le Saint-Laurent dans ma classe*, most interactions with the local community are through either guest presentations by community members or field trips in the community. However, the school completed a beach cleanup in 2017 and left a bucket on the beach to encourage other community members to pick up garbage. This action could be considered an example of the school acting as a social agent. For this role to become clearer, and to further help students become agents of change, events like this one should involve greater collaboration between the students and the community members. For instance, the students could pick up garbage alongside local community members through a community cleanup event. Another way for the school to become an agent of change would be for students to partner with the municipal council as participants in the local democracy and decision-making processes. At the GIRRAKOOL primary school, in Australia, the environment is integrated into all aspects of the curriculum (Kennelly et al., 2011), much like the ocean at the St. Lawrence middle school. Students from the GIRRAKOOL primary school presented on water management to their local council (Kennelly et al., 2011). Students at the St. Lawrence middle school could do the same for their own local council, and this activity could be integrated into the new two-year plan.

The two-year plan implemented in September 2020 will hopefully ensure longer-term stability of the program *Le Saint-Laurent dans ma classe*. During interviews in July, teachers informed me that this two-year plan would include set activities, themes, and presentations by specialists. In September, I contacted a teacher as an informal follow-up to an interview completed in July. During this informal discussion, I learned that between July and September, the school realized the advantages of allowing teachers to decide for themselves which activity to organize in their classes. This autonomy gives teachers space to exert their professional judgement and to collaborate in innovative ways (Ralph et al., 2020). Teachers had access to the folder with past marine activities but were given the freedom to pick an activity from the folder or to do something different. The school decided to keep the themes and invited experts included in the two-year plan to provide a framework for the program.

During this same discussion in September 2020, I learned that the implementation of the two-year plan went very well. The first theme of the year was marine plastic pollution, and the school had already conducted multiple activities on that topic. For instance, students received a presentation on *Mission 100 tonnes* [100 Tonnes Mission] (<http://www.mission100tonnes.com>), a campaign aiming to collect 100 tonnes of garbage from waterways. Following the presentation, they collected garbage on the beach behind the school. They then planned to complete a mural with the garbage for their art class. Three activities over the single month of September are a significant increase over the few activities completed over the entire 2019/2020 school year, showing the potential of this new approach.

The location of the school was an enabler that tied many of the program's characteristics together. The relevance of the program's marine theme to the community emerged from its coastal location. Having access to marine experts, institutions, and industries was also linked to this location. Place-based education is a recognized approach to helping participants in educational programs (students, teachers, parents, etc.) feel more connected to where they live (Meichtry & Smith, 2007). It encourages participants to engage in such programs because they understand their relevance (Powers, 2004). The fact that the activities in the program *Le Saint-Laurent dans ma classe* were based on the reality of the coastal community enabled engagement from the school community.

Recommendations

Through this research, I found that teachers at the St. Lawrence middle school feel unsupported when it comes to teaching ocean concepts by themselves, even though they have the backing support of parents and school community

members. They feel proud to be part of this program, but they lack the support of a community of practice and struggle to find resources. Based on these results and the literature, I identified three recommendations for schools who wish to overcome barriers related to the implementation of ocean literacy programs: (1) identify a program coordinator, (2) provide teachers with professional development opportunities, and (3) develop partnerships with other schools and organizations.

Assigning a program coordinator. Having access to an educational consultant enabled the early development of program but was not financially sustainable. Non-governmental organizations (NGOs) might be interested in taking on this role at a reduced cost. Other options include collaborating with a university professor of teacher education or selecting a school teacher to become the program coordinator. At the Girrakool primary school, a teacher was appointed as the “environmental education leader.” Having this leader was a major driver of the school’s environmental education program (Kennelly et al., 2011). However, in the case of high staff turnover, having someone outside the school as a coordinator may be best for the stability of the program.

Offering professional development for teachers. I recommend that schools seek professional development opportunities through existing environmental education communities of practice and through emerging ocean literacy communities of practice (e.g., Glithero, 2020; Santoro et al., 2017). Henderson and Tilbury (2004) recommend professional development as a way to overcome the challenges associated with change in the school system. In fact, professional development “can assist teachers by providing support and motivation to implement changes [...] and building capacities for institutional change” (p. 22). Professional development could also help sustain teacher interest in the program.

Developing partnerships outside the school. To access more marine education resources, schools can collaborate with non-formal education programs; Henderson and Tilbury (2004) and Arena et al. (2009) recommend collaboration with existing initiatives to enrich educational programs and avoid duplication of work. For instance, the St. Lawrence middle school already benefitted from their collaboration with *Mission 100 tonnes*. This collaboration was highly valuable as it helped teachers gain experience in hands-on, placed-based education.

Partnerships could also be established with other schools to develop a local community of practice. This collaboration can be as simple as sharing activity ideas with other schools in the area. Such a collaboration would allow teachers to connect with other people who understand the reality of teaching in their region. Teachers could then learn from each other’s experience, share resources, and develop collaborative projects.

Conclusion

The program *Le Saint-Laurent dans ma classe* was not solely created as a planned initiative to increase ocean literacy. Rather, it was implemented as an ad hoc measure, driven by the urgent need to save the school. Since its implementation in 2017, the program has met many barriers, such as a lack of educational resources and a lack of funding. The COVID-19 pandemic also brought new challenges to the school and local community. Although the future of the program is uncertain, the school community has already managed to overcome many barriers. This is because the program addresses the needs of the community—including the need to save the school—and builds on the strengths of its committed local community and its connection to the St. Lawrence Estuary. Participants in this study made it clear that what made this program so special was the fact that it was anchored in the school's local context. This characteristic of the program is at the root of its resilience. If other similar programs are implemented in Canada, they should also be tailored to their own local context. Moreover, the St. Lawrence middle school continuously modified the program based on feedback from the people involved. New programs should also be continuously reviewed to allow for greater adaptive capacity.

This case study may inspire other schools to build upon their local strengths to foster ocean literacy and resilience among their community. The creation of multiple locally relevant and adaptive ocean literacy programs across Quebec and Canada would allow for the emergence of a collaborative network of schools that are connected to the ocean and to each other, each strengthened by their local uniqueness and regional diversity. This, in turn, would create opportunities to foster resilience in coastal communities and sustain their crucial relationship with a rapidly changing ocean.

Acknowledgements

I would like to thank the study participants for generously sharing their time and insights with me.

I would also like to thank Dr. Julia Ostertag (Canadian Ocean Literacy Coalition) and Dr. Jerry Bannister (Marine Affairs Program, Dalhousie University) for their extensive feedback throughout this research.

Funding details

This work was supported by FQRNT under a B1X masters research scholarship (number 275717) and the Sobey Fund for Oceans.

Footnotes

Original quotes from participants:

- 1 “Tout le monde se dit que quelqu’un d’autre va le faire, et ça finit que personne ne le fait.”
- 2 “Il y a tellement de mouvement niveau du personnel qui se font qu’il n’y a personne qui planifie la rentrée scolaire qui va suivre [en avance] parce que tout est à recommencer au cours du mois d’août avec pas nécessairement la même équipe.”
- 3 “Roulement du personnel enseignant”
- 4 “C’était toujours des passionnés. [...] On a eu un moment donné un écrivain qui nous a conté son histoire. Les enfants ont fait de la plongée sous-marine. Ça ne s’arrête pas.”
- 5 “Garder le cap pour que les transitions se fassent avec une grande motivation”
- 6 “Une ressource inestimable”

References

- Arena, F., Riopel, M.-C., & Des Ruisseaux, M. (2009). *Rapport sur l'état et les besoins de l'éducation, 2006-2008. L'éducation en région éloignée : une responsabilité collective [Report on the states and the needs of education, 2006-2008. Education in remote regions: A shared responsibility]*. Conseil supérieur de l'éducation. <http://www1.cse.gouv.qc.ca/fichiers/documents/publications/CEBE/50-0188-01.pdf>
- Askell-Williams, H., & Koh, G. A. (2020). Enhancing the sustainability of school improvement initiatives. *School Effectiveness and School Improvement, 31*(4), 660–678. <https://doi.org/10.1080/09243453.2020.1767657>
- Barnes, G., Crowe, E., & Schaefer, B. (2007). *The cost of teacher turnover in five school districts: A pilot study*. National Commission on Teaching and America's Future. <https://files.eric.ed.gov/fulltext/ED497176.pdf>
- Carver-Thomas, D., & Darling-Hammond, L. (2017). *Teacher turnover: Why it matters and what we can do about it*. Learning Policy Institute. https://learningpolicyinstitute.org/sites/default/files/product-files/Teacher_Turnover_BRIEF.pdf
- Crain, C. M., Halpern, B. S., Beck, M. W., & Kappel, C. V. (2009). Understanding and managing human threats to the coastal marine environment. *Annals of the New York Academy of Sciences, 1162*(1), 39–62. <https://doi.org/10.1111/j.1749-6632.2009.04496.x>
- Freeman, M., & Mathison, S. (2008). *Researching Children's Experiences*. Guildord Publications, Inc.
- Glithero, L. (2020, June). *Understanding ocean literacy in Canada: National Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/08/COLC_National-Report_Final_2020.pdf
- Glithero, L., & Zandvliet, D. (2020, June). *Canadian ocean literacy survey: Highlight Report*. Canadian Ocean Literacy Coalition. <https://colcoalition.ca/wp-content/uploads/2020/06/COLSurvey-Highlights-Report-FINAL-1.pdf>

- Gough, A. (2017). Educating for the marine environment: Challenges for schools and scientists. *Marine Pollution Bulletin*, 124(2), 633-638. <https://doi.org/10.1016/j.marpolbul.2017.06.069>
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11(3), 255–274. <https://doi.org/10.3102/01623737011003255>
- Greene, S., & Hill, M. (2005). Researching children's experience: Methods and methodological issues. In S. Greene & M. Hill (Eds.), *Researching children's experience: Methods and approaches* (pp. 2-21). Sage.
- Halcomb, E., & Hickman, L. (2015). Mixed methods research. *Nursing Standard*, 29(32), 41–47. <https://doi.org/10.7748/ns.29.32.41.e8858>
- Henderson, K., & Tilbury, D. (2004). *Whole-school approaches to sustainability: An international review of whole-school sustainability programs*. Australian Research Institute in Education for Sustainability, Macquarie University. http://aries.mq.edu.au/projects/whole_school/files/international_review.pdf
- Hill, M. (2005). Ethical considerations in researching children's experiences. In S. Greene & D. Hogan (Eds.), *Researching children's experience: Methods and approaches* (pp. 61–86). Sage. <http://eprints.gla.ac.uk/33727/>
- Kennelly, J., Taylor, N., & Serrow, P. (2011). Environmental education and the whole school approach in one Australian primary school. *Economic and Environmental Studies*, 11(2), 125–143.
- Kirk, S. (2007). Methodological and ethical issues in conducting qualitative research with children and young people: A literature review. *International Journal of Nursing Studies*, 44(7), 1250–1260. <https://doi.org/10.1016/j.ijnurstu.2006.08.015>
- Lambert, J., & Sunburg, S. (2006). Ocean science in the classroom. *The Science Teacher*, 73(6), 40-43.
- Leather, M., & Nicholls, F. (2016). More than activities: Using a 'sense of place' to enrich student experience in adventure sport. *Sport, Education and Society*, 21(3), 443–464. <https://doi.org/10.1080/13573322.2014.927758>
- Longobardi, C., Prino, L. E., Marengo, D., & Settanni, M. (2016). Student-teacher relationships as a protective factor for school adjustment during the transition from middle to high school. *Frontiers in Psychology*, 7. <https://doi.org/10.3389/fpsyg.2016.01988>
- McKinley, E., & Fletcher, S. (2012). Improving marine environmental health through marine citizenship: A call for debate. *Marine Policy*, 36(3), 839–843. <https://doi.org/10.1016/j.marpol.2011.11.001>
- McPherson, K., Wright, T., & Tyedmers, P. (2020). Challenges and prospects to the integration of ocean education into high school science courses in Nova Scotia. *Applied Environmental Education & Communication*, 19(2), 129–140. <https://doi.org/10.1080/1533015X.2018.1533439>
- Meichtry, Y., & Smith, J. (2007). The impact of a place-based professional development program on teachers' confidence, attitudes, and classroom practices. *The Journal of Environmental Education*, 38(2), 15–32. <https://doi.org/10.3200/JOEE.38.1.15-34>
- Österblom, H., Wabnitz, C. C. C., & Tladi, D. (2020). *Towards ocean equity*. World Resources Institute. <https://www.oceanpanel.org/sites/default/files/2020-04/towards-ocean-equity.pdf>

- Payne, D. L., & Zimmerman, T. D. (2010). Beyond Terra firma: Bringing ocean and aquatic sciences to environmental and science teacher education. In A. M. Bodzin, B. S. Klein, & S. Weaver (Eds.), *The inclusion of environmental education in science teacher education* (pp. 81–94). Springer. https://doi.org/10.1007/978-90-481-9222-9_6
- Powers, A. L. (2004). An evaluation of four place-based education programs. *The Journal of Environmental Education*, 35(4), 17–32. <https://doi.org/10.3200/JOEE.35.4.17-32>
- Quebec Ministry of Education. (2006). Programme de formation de l'école québécoise. Éducation préscolaire et enseignement primaire [Training program of the Quebec school. Pre-school and primary education]. http://www.education.gouv.qc.ca/fileadmin/site_web/documents/dpse/formation_jeunes/prform2001.pdf
- Quebec Ministry of Education. (n.d.). Programme de formation de l'école québécoise. Éducation secondaire [Training program of the Quebec school. High school]. Retrieved from http://www.education.gouv.qc.ca/fileadmin/site_web/documents/dpse/formation_jeunes/prform2001.pdf
- Ralph, M., Robbins, D., Young, S., & Woodruff, L. (2020). Collaborative autonomy: Exploring the professional freedom of three science teachers. *Educational Considerations*, 46(1), Article 4. <https://doi.org/10.4148/0146-9282.2197>
- Santoro, F., Santin, S., Scowcroft, G., Fauville, G., & Tuddenham, P. (2017). *Ocean literacy for all. A toolkit* (IOC Manuals and Guides, 80). IOC/UNESCO & UNESCO Venice Office. <https://unesdoc.unesco.org/ark:/48223/pf0000260721>
- Sauvé, L., Asselin, H., Marcoux, C., & Robitaille, J. (2018). Stratégie québécoise d'éducation en matière d'environnement et d'écocitoyenneté [Quebec strategy for environmental and eco-citizenship education]. Centre de recherche en éducation et formation relatives à l'environnement et à l'écocitoyenneté.
- Schoedinger, S., Cava, F., & Jewell, B. (2006). The need for ocean literacy in the classroom. *The Science Teacher*, 73(6), 44-53.
- Sobel, D. (2004). *Place-based education: Connecting classroom and community*. The Orion Society.
- Statistics Canada. (2016). Data products, 2016 census. <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm>
- Stewart, E. A. (2019). Ocean literacy matters in Canada. *Journal of Ocean Technology*, 14(2), 112–121.
- UNESCO Institute for Statistics. (2012). *International standard classification of education: ISCED 2011*. <http://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-isced-2011-en.pdf>
- Uzzell, D. (1999). Education for environmental action in the community: New roles and relationships. *Cambridge Journal of Education*, 29(3), 397–413. <https://doi.org/10.1080/0305764990290309>
- Yin, R. (2014). *Case study research: Design and methods* (5th ed.). Sage.

Recognizing the Ocean's Identity

Jane Affleck, Bedeque, Prince Edward Island



Research Question

If you and the ocean could speak the same language, what would you say to each other?

Preparations and Planning

Prior to the “lockdown” mandated federally and provincially in the context of COVID-19, the research question was to be presented to the public in the form of three arts-based, in-person workshops, one in each of the three counties of Prince Edward Island (also known by Mi’kmaq as *Epekwitk*, meaning “lying in the water”). The three venues were:

- 1) The Summerside Rotary Library (provincially funded public library in Summerside, Prince County);
- 2) The Community Room at the Sobey’s on University Avenue in Charlottetown (Queen’s County);
- 3) Cavendish Wellness Centre (a multi-purpose community centre with fitness and other facilities in Montague, King’s County).

My original plan for the workshop was to have participants engage with the research question, as well as to participate in a guided meditation and art-making session that considered oysters and humans’ relationship to/with them. With workshops needing to be shifted to virtual or online delivery, I abandoned the idea of a livestream “event” and instead created an activity that would enable people to respond whenever they had the time or inclination by using a “mini-comic” as a possible prompt for engaging with the research question.

The comic presented empty dialogue bubbles that participants could fill in as they saw fit. I chose the comics-style imagery because I thought it might appeal to both children and adults. Parents could sit down with their child(ren) and work on a response together, or kids could complete it alone. That said, I also know that comics can have a wide age appeal and that they have broad sociocultural significance in the context of literary studies, the visual arts, and art-making.

Process and Methodology

In keeping with the idea of making the experience as accessible/open as possible, I offered participants the choice to either fill in the speech bubbles on my provided comic or create their own comic, drawing, story, poem, etc. As a third option, I also created a short list of questions to potentially engage a greater range of participants.

The image on the first page of my comic prompt is of a non-gender-specific child holding a conch shell up to their ear, from which flows a blue wave representing the ocean. A speech or dialogue bubble extends from the child's head containing only the word "Hello?" This image is based on the notion that we can "hear" the ocean by holding this type of shell to our ear. A Google search suggested that this is a widely recognized visual symbol signifying the potential for a conversation between a human being and the ocean.

There was a total of 14 individual responses in various media/modes (the addition of dialogue to the comic; an artwork or piece of writing inspired by the question; answers to the original questionnaire; or a conversation).

Several general themes emerged from the responses:

- identity, ontology, the nature of being, the oneness of being, diversity
- interdependence, symbiosis, mutuality, responsibility, reciprocity
- sadness/sorrow (including solastalgia), concern, regret, apology
- wonder, curiosity, fascination, amazement, gratitude, devotion, love
- change, cycles, lifecycles, sickness, pollution, waste, destruction, death
- the future, future generations (human but also more-than-human)
- climate change/the Anthropocene (in particular, ocean temperature and acidification)

Participants also asked many specific questions of the ocean, including: What is your name? What/who are you really? Why are you so salty? How can we give back to the oceans? How are you? ("I just wanted to 'sea' how you are doing...")

In my view, the nature of the research question implicitly prompts responses based on, or manifesting as, dialogue, as well as on notions of reciprocity. The majority of responses suggest that participants view the ocean as an entity with some kind of identity, albeit one that may be rather amorphous or undefined. Furthermore, in recognizing the ocean's identity and the gift-giving facets of their being, the majority of responses indicate that humans owe them our respect and admiration. As well, a couple of respondents noted that humans often have derived their identities from proximity to or engagement with the ocean. Prince Edward "Islanders," for example, would not be "Islanders" if not for the fact of being surrounded by water.

Note that I am using pronouns "they," "them," and "their" when referring to "the ocean" in order to communicate several points: that the ocean has no gender; that there are several oceans around the globe; that "the ocean" may, perhaps paradoxically, be best understood as both singular and plural. Furthermore, I support not using the pronoun "it," following from Robin Wall Kimmerer's (2013) work, *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*. As she explains, "it" tends to objectify its referent, and Kimmerer, as a member of the Citizen Potawatomi Nation, asks whether white people/people of European descent should stop using

“it” in relation to other living beings, as doing so leads more easily to being disrespectful, wasteful, etc.

Many of my ways of thinking about and knowing the natural world, including the ocean, have been amplified or enhanced by reading, hearing, or otherwise learning about the worldviews of Indigenous peoples. As I understand it, land-based education is a huge part of Indigenous resurgence across Turtle Island (now more commonly known as North America). Is it possible to also incorporate a kind of “ocean-based” learning? The underlying notion is that a major paradigm shift needs to happen with regard to humans’ place in the “natural” world, our role as stewards, and how to have a more mutually beneficial and reciprocal relationship with the ocean.

References

Kimmerer, R.W. (2013). *Braiding Sweetgrass: Indigenous Wisdom, Scientific Knowledge, and the Teachings of Plants*. Milkweed Editions: Minneapolis, Minnesota.

Community-Based Ocean Literacy: Four Examples of Ocean Optimism From Mi'kma'ki/Atlantic Canada

Julia Ostertag, Dalhousie University; Ammendolia, Justine, Canadian Ocean Literacy Coalition; Vance, Alexandra, Oceans Week HFX Co-founder; McPherson, Kerri & Hamelin, Kayla M., Dalhousie University; Cousineau, Maryse & Daoud, Dounia, Homarus, Inc.; Morissette, Lyne, M - Expertise Marine; Orren, Kimberly, Fishing for Success; Hill, Amy, VanderKloet, Evelien, Whoriskey, Fred., Iverson, Sara & Sutherland, Maggie, Dalhousie University; Denny, Shelley, Unama'ki Institute of Natural Resources; Beland, Joseph & Syliboy, Alanna, Confederacy of Mainland Mi'kmaq; Stokesbury, Michael J. W., Acadia University; Porter, Darren, Marine Institute of Natural and Academic Science

Abstract

In this article, we consider the role of ocean literacy in coastal communities as an approach that fosters relevant, community-based learning. We also propose solutions to challenges facing human-ocean relationships by cultivating common understanding and collective action. We present four examples of community-based ocean literacy in Mi'kma'ki/Atlantic Canada demonstrate how intersectional approaches to ocean literacy that are context-specific and responsive to community priorities can foster healthier human-ocean relationships: (1) Oceans Week Halifax's organization of community events to strengthen human-ocean relationships; (2) the Apoqnmaulti'k (Mi'kmaw: we help each other) project's partnerships between Mi'kmaq and local knowledge holders and academia; (3) Fishing For Success's (Newfoundland and Labrador) inclusive approaches to connecting marginalized communities to the ocean; and (4) the Co-Existing With North Atlantic Right Whale Project's protection of whales without jeopardizing coastal community livelihoods. Without denying there are barriers to bridging community learning with formal education, we focus on opportunities for collaborations and the importance of ocean optimism in guiding these urgently needed efforts to benefit future community-based, ocean-focused, and solutions-orientated initiatives.

Résumé

Dans le présent article, nous examinons le rôle la connaissance de l'océan dans les communautés côtières comme approche pour favoriser l'apprentissage en milieu communautaire. Nous proposons également des solutions aux difficultés qui entravent la relation entre les humains et l'océan en cultivant la compréhension commune et l'action collective. Nous présentons quatre exemples de programmes communautaires dans la région Mi'kma'ki (Canada atlantique) qui montrent que les approches intersectionnelles de la connaissance de l'océan, lorsqu'elles sont adaptées au contexte ainsi qu'aux priorités des communautés, favorisent des relations saines entre les humains et l'océan. Les exemples sont les suivants : 1) l'organisation, par Oceans Week Halifax [la semaine de l'océan à Halifax],

d'activités communautaires pour renforcer le lien entre les humains et l'océan; 2) les partenariats du projet Apoqmatulti'k (qui signifie « nous nous entraïdons » en mi'kmaw) entre les Mi'kmaq, les experts locaux et le milieu universitaire; 3) les approches inclusives de Fishing For Success (Pêcher pour le succès; Terre-Neuve-et-Labrador) pour connecter les communautés marginalisées à l'océan; 4) la protection des baleines grâce au Co-Existing With North Atlantic Right Whale Project [projet de coexistence avec la baleine noire de l'Atlantique Nord] sans mettre en péril les moyens de subsistance des collectivités côtières. Nous savons qu'il n'est pas simple de jeter des ponts entre l'apprentissage communautaire et l'éducation en milieu scolaire, mais nous nous concentrons plutôt sur les possibilités de collaboration et sur l'importance de rester optimistes dans les actions de protection de l'océan pour guider les efforts urgents à faire, afin que les futures initiatives communautaires de recherche de solutions pour l'océan en profitent.

Keywords: ocean literacy, community-based, ocean optimism, case study, Atlantic, Mi'kma'ki

Mots-clés : connaissance de l'océan, programme communautaire, optimisme dans les actions de protection de l'océan, étude de cas, Atlantique, Mi'kma'ki

Introduction

Communities that come together to learn about and take action on ocean issues foster healthier, more collaborative, and more fulfilling relationships with one another and the ocean. In the context of Mi'kma'ki/Atlantic Canada, joining together to understand and resolve challenges in human–ocean relationships is especially important since regional cultures, identities, industries, trades, and histories are deeply and distinctly connected to the ocean. However, these solutions can be difficult to achieve given the complexity of the relationships and the legacies of conflict and distrust (Ostertag & Ammendolia, 2020) that often continue to hinder the collaborations and consultations necessary to catalyze collective actions. With a specific focus on Mi'kma'ki/Atlantic Canada, this paper considers regional issues that communities are currently struggling to address, including the designation of marine protected areas, expression of Indigenous Treaty rights and unrestricted access to fisheries, growth in marine renewable energies and aquaculture, climate change and its impacts on coastal communities, and industrial projects such as offshore oil and gas. Drawing on the teachings of Mi'kmaq Elder Albert Marshall, Indigenous communities across Mi'kma'ki have noted an urgent need for Two-Eyed Seeing and knowledge co-existence (see Reid et al., 2020) since these can lead to a shared understanding and collective call-to-action to co-develop environmental- and community-based solutions to address regional issues and crises confronting the global ocean.

While community-based projects typically emerge to address local priorities through action-oriented initiatives, the collective learning processes that enable these projects to flourish reflect the goal of ocean literacy to engage diverse actors and knowledge systems in order to better understand “the ocean’s influence on us and our influence on the ocean” (Santoro et al., 2017, p. 5). Thus, community-based projects contribute to advancing ocean knowledge systems (e.g., scientific, Indigenous, local), strengthening ocean values (e.g., life-sustaining, cultural, economic, personal), and mobilizing ocean actions (e.g., individual behavioural change, social justice actions, ocean governance). We collaborated with community organizations, ocean literacy educators, and researchers to present, in this article, four community-based projects from across Mi’kma’ki/Atlantic Canada that exemplify ocean optimism. Each organization was also part of the Canadian Ocean Literacy Coalition’s *Understanding Ocean Literacy in Canada* Atlantic regional study conducted in 2019–2020 (Ostertag & Ammendolia, 2020). We examine these projects’ challenges and limitations and provide insights into building bridges between informal education, community-based interventions, and formal education.

The first example is Oceans Week Halifax, based in K’jipuktuk/Halifax. We discuss the creation of this grassroots project, one which celebrates World Oceans Day by exploring various local and regional ocean solutions and diverse human–ocean connections. The second example is the Apoqmatulti’k (Mi’kmaw: *we help each other*) project, which joins Mi’kmaq and local knowledge holders with academia to work together to better understand economically and culturally valued species in response to local community priorities. In the third example, the Fishing for Success project in Petty Harbour, Newfoundland and Labrador, we examine inclusive approaches to connecting diverse and marginalized communities to the ocean through fishing, food, community, and culture. Our fourth example is a collaborative project co-designed *by* and *for* fishing communities to co-exist with endangered North Atlantic Right Whales without jeopardizing coastal community livelihoods. While each example is uniquely situated (i.e., geographically, linguistically, culturally, and socio-economically), together they illustrate common challenges, commitments, and approaches to healthier human–ocean relationships. These initiatives are instructive for re-imagining community-based ocean literacy across Canada and Turtle Island.

Prior to delving into our research methods and outcomes, we would like to acknowledge that the spirit of knowledge co-creation that lies at the heart of our understanding of community-based ocean literacy also informs the co-creation of this article. Partners from the four projects, as well as leading voices in the movement for ocean literacy that participated in the Atlantic regional study, collaborated on this article. While this may not be a convention in education research publications, feminist and decolonial approaches recognize the multiple knowledge systems (e.g., academic, community, Indigenous) that contribute to knowledge co-production (Liboiron et al., 2017;

Reilly, 2010). In co-authoring this article, our positionalities broaden to include the following: primarily white settlers; primarily womxn¹; Indigenous People; academic researchers; local experts; inland and coastal community members located primarily but not exclusively throughout Mi'kma'ki/Atlantic Canada; urban and rural dwellers; multiple linguistic communities (notably anglophone, francophone, and Mi'kmaw); and others. Evidently, prominent gaps continue to limit what and whose knowledge is included in these conversations; however, our collaborative approach to writing attempts to enact relationship-building strategies committed to overcoming systemic inequities in creating and sharing community-based knowledge.

Methodology

The examples presented in this article emerged during a year-long mixed methods study of ocean literacy across Canada led by the Canadian Ocean Literacy Coalition (COLC) (see Glithero, 2020 for a full description of the participatory study and COLC's collaborative approach to ocean literacy in Canada). The COLC research team conducted surveys, semi-structured interviews, and document scans to examine ocean literacy across nine sectors (government, NGO and advocacy, academia and research, industry, education, community, media, cultural heritage, and health) and across five regions in Canada. In total, the Atlantic regional study (Ostertag & Ammendolia, 2020) that is the basis for this article included 52 semi-structured interviews conducted by co-authors Julia Ostertag (Atlantic regional coordinator) and Justine Ammendolia (Newfoundland coordinator). Interviews were conducted in English and French with a wide range of ocean actors from each of the four Atlantic provinces: Newfoundland and Labrador (n = 18), Nova Scotia (n = 25), New Brunswick (n = 7), and Prince Edward Island (n = 2). Additionally, 61 participants completed an online organizational survey to map relevant ocean literacy initiatives and the projects' strengths and barriers throughout the region.

The four examples that we present in this article emerged from the Atlantic regional study and its semi-structured interviews. Participants from each initiative worked with the regional coordinators to write each case study for the Atlantic report (six case studies in total), review drafts of the Atlantic report, rewrite four of the cases for this article with a focus on community collaborations in intersectional contexts, and contribute to the conceptualization and co-authorship of this article. Moreover, these four examples were specifically selected to represent a range of distinct community contexts and community responses to different ocean issues. For instance, the communities profiled include three Atlantic provinces, small coastal communities, a large urban municipality, different spoken languages (French, English, Mi'kmaw), unique approaches to collaboration, distinct cultures, and diverse community values, interests, and

priorities. This regional lens allows for a more focused discussion on approaches to ocean issues specific to Mi'kma'ki/Atlantic Canada, though we invite you to read the full regional reports (<https://colcoalition.ca/our-projects/regional-reports/>) to gain an understanding of the notable distinctions and similarities when compared with other regions in Canada, namely, Inuit Nunangat, Pacific, Saint Lawrence (including the Great Lakes), and Inland Canada.

As a form of case study methodology, the collaborative approach to this article reflects a participatory case study process (Reilly, 2010), which engages project participants throughout the research process and is explicitly committed to empowerment, justice, and action. Furthermore, participatory case study research centres the lived experiences and oftentimes marginalized voices of community participants. In co-authoring and collaborating on this article, we amplify the voices, experiences, and knowledge from community-based initiatives that rarely have broader platforms beyond their local region to share the story of their work.

The case study approach also aligns with our ocean optimism framework (Kelsey 2016, 2021) by providing concrete examples of successful ocean projects that have benefited human–ocean relationships. We have rejected contributing to the “doom and gloom” (Johns & Jacquet, 2018) narratives that dominate headlines and limit our imaginations. While we do not intend to suggest the four interventions presented in this article are objective, unbiased, or replicable models, they nevertheless serve as examples of ocean optimism and “bright spots” (Cvitanovic & Hobday, 2018) that illustrate how, despite documented barriers and challenges, projects have tackled complex ocean issues collaboratively and meaningfully. While it is not within the scope of this article to evaluate the degree to which the four projects have been successful in transforming human–ocean relationships and increasing ocean literacy, the positive outcomes ring loud and clear for the community members invested in each initiative. Thus, we anticipate that these examples of ocean optimism will be inspiring and empowering for other communities, educators, and policy makers, illustrating the possibilities for both agency and action based upon common interests and knowledge co-production.

Community-Based Ocean Literacy and Ocean Optimism

To better understand the role and value of community-based ocean literacy, it is helpful to first position this approach within the existing literature on ocean literacy and community-based environmental education, as well as its alignment with ocean optimism as a lens that connects across our examples. Since ocean literacy and environmental education have largely been focused on formal and non-formal education directed toward children and youth, broadening our attention to learning processes in informal community contexts is needed to understand wider opportunities for environmental education and action.

Ocean Literacy

Ocean literacy fits within the frameworks of environmental education (Gough, 2017), sustainability education, and ecological literacy (Kwauk, 2020); however, these frameworks generally express an implicit land bias and frequently lack explicit ocean content (Kelly, 2018). Ocean literacy, therefore, highlights the need for holistic approaches to ocean education within environmental education by helping all people connect to and better understand their place in the ocean continuum (Glithero, 2020)—a continuum that includes inland watersheds, aquifers, permafrost, glaciers, estuaries, coasts, sea ice, and open oceans. Holistic approaches to understanding the continuum take into account how the features along the continuum are inextricably and dynamically linked with one another and all earth systems.

To summarize briefly, the term “ocean literacy” first emerged in 2002 when concerned educators and ocean scientists in the United States (U.S.) noted that youth from Kindergarten to Grade 12 lacked sufficient ocean science knowledge (National Oceanic and Atmospheric Association [NOAA], 2013; U.S. Commission on Ocean Policy, 2004). Drawing on Western scientific methods to study and understand the ocean, the National Oceanic and Atmospheric Association (NOAA, 2013) developed an ocean literacy toolkit with seven key ocean science principles and 45 fundamental concepts that are aligned with the U.S. National Science Education Standards. In 2017, the IOC-UNESCO expanded on these seven principles and released the *Ocean Literacy for All: A Toolkit* (Santoro et al., 2017), connecting ocean literacy to the UN Sustainable Development Goals, civic engagement, multiple disciplines, experiential learning, multiple sectors, ocean governance, and the global ocean movement.

In 2013, Canada signed the Galway Statement on Atlantic Ocean Cooperation, which includes commitments to furthering ocean literacy (European Commission, 2013). Ocean science educators in Canada have identified many of the same concerns as in the United States and European Union, namely that the majority of K-12 students lack access to ocean science and knowledge systems. In Atlantic Canada, researchers have found that a significant proportion of students not only lack a general understanding of the ocean but also abhor and fear it (Guest et al., 2015; McPherson et al., 2018). In a provincial response, the Nova Scotia Department of Education (2015) developed courses and course content to help introduce ocean sciences and ocean literacy into the classroom. Other regions have engaged in similar approaches, but this has been ad hoc across the country given that provinces develop their own curricula and thus there is no national ocean literacy framework.

Although many ocean literacy advocates across Canada recognize the importance of a national ocean literacy framework, it is also clear that this framework must be co-developed to take into account a myriad of regional, cultural, historic, and linguistic differences. This is especially important in terms of incorporating Indigenous knowledge systems, cultural practices,

governance systems, and rights in a meaningful, non-exploitive way. As Held (2018) stated at the Canadian Ocean Education Network (CaNOE) conference in 2018, “a cross-cultural approach is imperative in order to reject the current colonial hierarchy of knowledge and advance the process of decolonization and reconciliation” (para. 5). Furthermore, CaNOE founding Director Anne Stewart (2019) noted that,

Canadian ocean literacy differentiates itself from the prevailing European and American paradigms partly because of the enduring knowledge systems of Indigenous peoples. Indigenous laws, knowledge, traditional ecological knowledge, and Inuit Qaujimaqatuqangit are recognized as different but also as facets of modern Canadian ocean science. These knowledge systems cannot be subsumed by Western science and must stand on distinct yet equal footing. (p. 116)

In addition to these limitations of the term “ocean literacy,” many organizations are either unaware of or uncomfortable with the concept of ocean literacy. In Atlantic Canada, 65% of COLC survey respondents noted that they “never” or “seldom” use the term ocean literacy to describe their ocean-related projects given its connections to formal education, deficit framing, and a strict focus on a Western science approach to education (Ostertag & Ammendolia, 2020). As one survey participant explained, “Ocean literacy, even the term literacy itself, is kind of an elitist term. And even the language that comes out of ocean science, it’s more or less elitist. And the access to data, that’s elitist” (as cited in Ostertag & Ammendolia, 2020, p. 8). Organizations that were familiar with the term often used it flexibly, depending on their audience, and largely employed it for grant-writing or reporting purposes. Expanding the term “ocean literacy” to “community-based ocean literacy,” as we are proposing in this article, does not resolve the limitations and negative connotations associated with the former term. However, we hope it reflects the need for ocean literacy to include a more diverse range of relevant initiatives and knowledge systems.

Community-Based Environmental Education

Community learning and knowledge co-production are increasingly being recognized as powerful forms of environmental education and education for sustainable development (North American Association of Environmental Education [NAAEE], 2017). While it can be difficult to clearly define the scope and outcomes of community-based environmental education, Aguilar (2018) establishes the importance of rooting objectives in multiple community partnerships and projects that address specific community issues, orienting these projects toward collaborative civic action, and engaging in reflections on social institutions and power dynamics. Community-based environmental education initiatives allow for partnerships between formal settings (e.g., schools), non-formal settings (e.g., aquariums, museums, interpretive centres,

parks, recreational spaces, and media), and informal spaces (e.g., home, work, community) (Paraskeva-Hadjichambi et al., 2020; Walter, 2020).

According to the North American Association of Environmental Education (NAAEE), communities are uniquely positioned to respond to local priorities and issues, as well as to connect with much broader ecosystems and sociocultural systems. The NAAEE (2017) also notes that communities do not exist in isolation from broader, interlocking systems:

From the natural systems that sustain us (e.g., forests, wetlands, soils, water, air), to the social systems that shape our lives (e.g., housing, transportation, legal, educational, spiritual), to governmental and economic systems, no element of community exists in isolation. An understanding of the interlocking systems is a critical foundation for building people's capacity to create a healthy, sustainable, and resilient future (p. 10).

Systems thinking, civic engagement, relationship building, and environmental literacies can all be cultivated through community-based environmental learning (Zachariou & Symeou, 2009). However, it is critical to recognize that inequities can limit access to and the impacts of community projects for marginalized and underrepresented community members, and that these projects (including our four examples presented below) do not inherently represent the priorities of all community members with regard to addressing local environmental issues and injustices.

Community-Based Ocean Literacy

In this article, we shift from formal or non-formal approaches to ocean literacy, which focus largely on teaching children and youth about ocean sciences, to community-based ocean literacy, which focuses on the learning that happens within community contexts. By significantly broadening our understanding of "Ocean Literacy for All" (Santoro et al., 2017) to include community-based environmental education as well as adult environmental and ecojustice education (Walter, 2020), we acknowledge the important yet undertheorized role of community learning in responding to ocean issues. Community-based ocean literacy denotes an inclusive and contemporary approach to ocean literacy by integrating a broad range of knowledge systems, values, actors, and actions that are relevant to community priorities. While these community priorities are often locally determined, they are also inevitably interconnected with stakeholders and rights-holders on regional, provincial, national, and international scales. That is, community knowledge systems, values, and actions are often scaled up to include and be encompassed by non-local priorities and contexts (Glasgow Caledonian University, 2020; this video presents Dr. Michael Mikulewicz's talk entitled *Climate Justice & Intersectionality: Exploring the Theoretical & Methodological Links*). Furthermore, since the ocean is inherently fluid and fundamental to all earth systems, the ocean continuum transcends human boundaries and jurisdictions,

let alone an individual community. Therefore, while community-based ocean literacy may focus on local priorities, these interventions in the ocean continuum intersect with social and environmental justice issues on multiple spatial and temporal scales. As Paasche and Bonsdorff (2018) remind us, the scope of the changes required can even extend beyond human timescales (e.g., ocean warming and acidification cannot be reversed within one human lifetime), which may result in perceptual barriers to taking local and global action.

Growing economic precarity, ecological uncertainties (especially in the face of climate change and biodiversity loss), and community organizations' lack of jurisdictional power limits their abilities to directly influence national and international policies and regulations to the extent necessary to effect large-scale change. Such precarity and uncertainty perpetuate the fragmentation of communities and undermine their capacity for effective collaboration. As a result, community-based responses to ocean issues often place enormous pressure on individual leaders and small civil society organizations to build truly collective, grassroots visions and actions. It often requires time, skill, funding, and care to build and sustain the collaborative relationships required to engage in identifying and addressing common community goals. Despite the challenges, community-based initiatives can nevertheless mobilize around community strengths and connections to coasts and ocean to take meaningful collective action. Through such social movements, important new knowledge and new questions are generated and shared (Kelley, 2002) as participants respond to complex issues, conflict, dissenting views, and organizational challenges and "learn how to become social actors" (Choudry & Shragge, 2011, p. 512). More specifically, through "trans-situational conditions (i.e., being connected to the issue, seeing the impact of the issue on them and their families/communities)" (Glithero et al., 2020, p. 34), community-based ocean literacy becomes a process of knowledge creation, mobilization, and action.

Ocean Optimism

The scale of global challenges relating to the ocean can result in paralysis and inaction, which is why we turn to ocean optimism to frame our examples of community-based ocean literacy. Ocean optimism is an approach to ocean conservation that was formally launched on World Oceans Day 2014 and is now integrated into many facets of society, ranging from academic research to social media campaigns (Knowlton, 2019). In response to the global inundation of "doom and gloom" stories about ocean health and ocean governance, ocean optimism promotes the mainstream inclusion of marine conservation success stories by highlighting examples of communities and projects that achieved their goals through social action. Kelsey (2016) explains that, "far from making us complacent, stories of resilience and recovery fuel hope. Feeling hopeful enhances our capacity to take meaningful action. And that action flourishes in the supportive community of others" (para. 18).

Ocean optimism advocates argue that the consequence of presenting the public with large environmental problems without accessible solutions can cause disengagement from important and collaborative actions (Balmford & Knowlton, 2017). Other researchers suggest that constant pessimism may lead to discouragement and fatigue (Landry et al., 2018; McAfee et al., 2019; Serani, 2008) that may inhibit our ability to take collective action by increasing anxiety among team members, increasing competition, and decreasing team performance (Cvitanovic & Hobday, 2018). By contrast, identifying, understanding, and celebrating successes may inspire and galvanize productive positive actions (Balmford & Knowlton 2017), team coordination, collaboration, and knowledge sharing (Cvitanovic & Hobday, 2018). Fostering this kind of collaboration is key to addressing complex ocean problems and the ongoing community fragmentation and conflict that continue to undermine progress on ocean issues.

Finally, while the need for ocean literacy and ocean optimism is becoming increasingly recognized, it remains important that these approaches respond to multiple knowledge systems and socio-economic inequities and oppression. Blue justice (Bennett et al., 2020), ocean equity (Österblom et al., 2020), marine justice (Martin et al., 2019), and ocean justice (Gardiner, 2020) must inform both ocean literacy and ocean optimism. For instance, responses by settler fishing communities (largely male), Fisheries and Oceans Canada, and the RCMP to the Sipekne’katik First Nation’s lobster fishery on the 21-year anniversary of the Marshall Decision (APTN News, 2019; Denny, 2020) highlights how this crisis is part of a shared history that requires both re-imagining and decolonizing what “we are all ocean people” (OWHFX, 2020) means. As Allison et al. (2020) insistently remind us,

Discourses about shared ocean values and campaigns for greater ocean literacy should not neglect the legacies of past exploitation and the denial of others’ values and knowledges. Nations that built their economies and societies through mercantilism and colonialism, and the nations that were exploited or colonised by them, will have differing perspectives and priorities in governing their ocean estate. (p. 29)

The following examples reflect diverse human relationships with the ocean and offer tentative examples of ocean optimism through their collective responses to community priorities, whether in an urban centre (Oceans Week Halifax), across distinct knowledge systems (the Apoqmatulti’k project), for newcomer refugee women in coastal Newfoundland (Fishing for Success), or through the transformation of relationships between fishing communities and endangered species (Co-Existing With North Atlantic Right Whales). However, our focus on ocean optimism and positive examples of community-based ocean literacy through these narratives is not with the intent to deny the presence of anxieties and conflicts that complicate each project’s processes and outcomes.

Further research is needed to unpack how each collaboration navigates conflict, dissent, and inevitable moments of despair but, for the purposes of this article, we focus on presenting how each initiative addresses ocean problems through optimism, active hope (Humphreys, 2019), intersectional collaborations, and the creation of livable futures.

Oceans Week Halifax

Oceans Week Halifax began almost three decades ago as an ongoing living legacy of World Oceans Day (WOD). According to founding member Carol Amaratunga, the first “Oceans Day” was envisioned by the International Centre for Ocean Development (based in K’jipuktuk /Halifax, Nova Scotia) and launched on June 8, 1992 at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro. Amaratunga (2019) notes,

It was the genesis of a global social movement in public education and ocean literacy. The event called for a greater awareness of our relationship with the world ocean; in particular, the need to better understand the cumulative human impacts on climate change and global warming. (p. 116)

In 2008, the United Nations formally recognized WOD as an “international public good,” and June 8 was designated for celebrating ocean awareness and action. Today, thousands of people across hundreds of countries participate in WOD events annually, with the number of participating communities and countries increasing each year. Since its inception in 1992, Oceans Day has been celebrated annually in K’jipuktuk. However, in 2016, Oceans Week Halifax (OWHFX) was launched to create even greater opportunities for community engagement through an ocean education and conservation lens. OWHFX is a community-based and youth-led volunteer initiative that aims to connect diverse actors in the local ocean community in order to promote greater awareness and advocacy for improving the health of the ocean, as well as to foster meaningful community partnerships. OWHFX supports local events that are inclusive, accessible, educational, open to the public, and fun. All events are streamlined onto a single digital platform that includes a community calendar, interactive map, active social media, and compelling photography. OWHFX also highlights local ocean solutions and optimism through community-based and interdisciplinary science and outreach projects. Events are hosted by a broad range of academic, governmental, NGO, Indigenous, and corporate groups and organizations, ensuring that OWHFX is highly representative of its community members, priorities, and current issues every year. OWHFX also hosts its own series of planning workshops, networking events, lectures, recreational activities, beach cleanups, and more as a means of further amplifying the work of the vibrant ocean community.

In 2019, OWHFX hosted the world's largest oceans week celebration with more than 40 events supported by over 35 organizations held over 10 days. The organization has expanded internationally by participating in the Explorer Club's World Oceans Week 2020, which hosted an online forum where OWHFX was featured as one of the three representative projects on behalf of the North-West Atlantic Ocean. It is worthwhile to note that OWHFX is an entirely volunteer-based initiative, co-founded by two women with academic backgrounds and professional experience in ocean sciences and communications, and who hope to continue learning about the ocean and its relationship to people by building genuine connections with their local community.

From WOD to OWHFX, the fundamental role of citizen engagement in creating connections to the ocean reflects a central commitment to ocean literacy through community-based approaches. Amaratunga (2019) reminds us, "As a social movement, World Oceans Day belongs in the public domain. It is not a proprietary name or concept and it belongs to every classroom, every community centre, library, school, university, and maritime museum in the world. WOD was, and is, a unique global social movement in the field of ocean literacy" (p. 117).

Two-Eyed Seeing and the Apoqnmulti'k Project

In order to better understand the impact that humans have on the ocean, we need innovative approaches informed by more than Western science. Indigenous and coastal communities have a deep relationship with the natural world, as well as comprehensive understandings of many aquatic species and their environments that can transform marine management. The principle of bringing together different knowledge systems to better understand the natural world is referred to by Mi'kmaw Elder Albert Marshall as *Etuaptmumk* (Mi'kmaw for Two-Eyed Seeing, see Reid et al., 2020). Understood as learning to use the strengths of Indigenous and Western ways of knowing for the benefit of all, this principle is foundational to Apoqnmulti'k (Mi'kmaw: *we help each other*) and the basis for a partnership built on sharing and co-developing knowledge.

Apoqnmulti'k is a three-year collaborative research project² that brings together the strengths of different knowledge systems (Mi'kmaw, local, and Western) to increase our collective understanding of the movements and habitat use of ecologically and culturally important species in Atlantic Canada's Bay of Fundy and Bras d'Or Lake ecosystems. All aspects of the project are co-developed, including project governance, research questions, research methods, and training, and they reflect the values of all partners. Co-management, shared decision making, and knowledge transfer are at the heart of Apoqnmulti'k and help ensure research and results are accessible and relevant to all users. Data collected are shared with communities, resource managers, and decision makers to support the stewardship of aquatic resources and the right of Mi'kmaq to self-determination.

Apoq̓nmatulti'k fosters learning and exchange across knowledge systems. Key to this is the diversity of the team, the incorporation of varied values within the partnership, and the openness of all partners to look beyond their own knowledge system. Project partner, Shelley Denny (Director of Aquatic Research and Stewardship, Unama'ki Institute of Natural Resources, UINR), notes “the willingness of the partners to learn to do things differently, and the courage to help each other because you don't know what you don't know. This sets our partnership apart from others and is in line with Mi'kmaw concepts of relying on many people for knowledge rather than one person (expert)” (as cited in Ostertag & Ammendolia, 2020, p. 39).

Community liaisons at each study site have been invaluable to Apoq̓nmatulti'k's success and have helped guide the exchange of knowledge and learning. On Bras d'Or Lake, project staff member and local resident Skyler Jeddore connects with his Mi'kmaw community, culture, and language to collect study samples and inform project activities while using Western science to tag *katew* (eel) and *jakej* (lobster). In the Bay of Fundy watershed, Alanna Syliboy does similar work facilitating the involvement of Mi'kmaq knowledge holders, providing communications support, advising on community engagement opportunities, and helping guide research activities to study *punamu* (tomcod) and *katew* (eel).

A key lesson learned is the need to devote time to establish trust and build relationships from the project's inception. Working with Mi'kmaq and local communities requires a different time frame than anticipated by granting councils, government, and academia, and is best achieved through in-person interactions. By taking this time, the project has established a diverse and inclusive partnership. Bay of Fundy fisher Darren Porter sums this up:

We're all happy with the way the data is produced because we do it together. That's true ocean literacy. There is no way for one person or one side of this equation to actually produce true ocean literacy. It needs to be a meaningful partnership that is completely equal. (as cited in Ostertag & Ammendolia, 2020, p. 39)

Through Apoq̓nmatulti'k, the project partners are working to support a different way of doing research that is guided by, and responds to, community knowledge and priorities.

Fishing For Success

When we look throughout human history, we have fished since the beginning. As soon as we could walk down to the shore we've been fishing. If you look at any culture, any culture near rivers, streams, ponds or oceans, those people have fished. They have fishing stories.

- Kimberly Orren, Co-founder and Project Manager,
Fishing for Success (TEDx Talks, 2018)

Located in Petty Harbour, Newfoundland, Fishing for Success is based on the idea that all humans have a shared heritage of fishing and that fishing connects communities to each other, to shared and diverse histories, and to the ocean. The small organization is also deeply premised on social justice and the conviction that fishing should be a “safe space,” accessible to everyone—youth, girls, women, the LGBTQ2S+ community, newcomers, people who ride transit, people with disabilities, people without boats, and, especially, people who don’t know anything about fishing! Through fishing, building small wooden dories, making nets, cooking fish, learning traditional music, using fish for art, and engaging in dozens of other activities for audiences of all ages, Fishing for Success strives to make everyone feel welcome and have their own personal relationship with the ocean and with water. It is these newly formed connections that may empower us to create a more inclusive, equitable, and sustainable ocean-centred future (TEDx Talks, 2018; this video presents Kimberly Orren’s talk about the organization *Fishing for Success*).

In partnership with Suzy Haghighi of the Association for New Canadians, Fishing for Success co-founder Kimberly Orren has developed the Women Sharing Heritage (WiSH) program to connect newcomer women with Canadian-born women (volunteers from their Girls Who Fish program) and with land, sea, and community. WiSH has been recognized by the Centre for Addiction and Mental Health as a “promising practice” that supports women and refugees who may have experienced or might be vulnerable to sexual and gender-based violence (SGBV) by creating safe spaces to facilitate social networks and create community belonging. Activities are nature-based and follow the interests of the participating women. According to Haghighi (2019),

Nature provides a safe space and time for self-directed healing and is a wonderful setting for cross-cultural knowledge exchange. The program has led to positive outcomes for many of the women we work with, including increased school attendance, fewer crisis interventions, and increased confidence in decision making with peers and family. (para 5)

Fishing for Success also collaborates with local organizations to increase food security for Indigenous, LGBTQ2S+, and other marginalized communities. Newfoundland and Labrador have long-standing food security challenges that have been exacerbated by the current COVID-19 crisis (Verma et al., 2020). Fishing for Success has responded to this local issue by developing a project called Fish for Friday that purchases fish from local plants or harvesters and distributes it to those in need through local food banks or prepared meal programs. By partnering with community groups that are already supporting vulnerable individuals and families, local fish is made available to those who might not normally have access to this nutritious and culturally appropriate food. Gifting a meal of fish forms a relationship with the ocean through food—one of the most intimate ways that we can come to understand how we depend

upon nature. With its focus on social justice, an “economy of care,” and a holistic blend of traditional knowledge, local knowledge, scientific knowledge, historical understandings, place-based connections, and the arts, Fishing for Success exemplifies inclusive approaches to community-based ocean literacy.

Co-Existing With North Atlantic Right Whales Project

North Atlantic Right Whales (NARW) are increasingly present in the Gulf of St. Lawrence, possibly as a result of climate change (Bigelow Laboratory for Ocean Sciences, 2019). The whales’ presence in this region leads to new interactions with other users of the marine environment, and thus new conservation challenges. Especially dangerous for the whales are entanglements and vessel strikes, which were identified as the cause of death for numerous right whales in 2017. In an urgent attempt to reduce mortalities of this species in the Gulf of St. Lawrence, Fisheries and Oceans Canada (DFO) enforced new management measures for crab and lobster fishers in 2018. However, these strict measures had significant unintended consequences for fishing communities along the coast.

In response to these impacts on lobster fishers in the region, Homarus Inc., the scientific research and education branch of the Maritime Fishermen’s Union (MFU), developed the Co-Existing With North Atlantic Right Whales Project. Launched in 2019, the collaborative and multi-sectoral project included partnerships with industry, coastal communities, governments, environmental NGOs, and academics.³ The goal was to develop solutions to ensure the protection of species at risk by putting fishers’ knowledge at the heart of management plans. In order to sustain coastal economies largely dependent on fisheries, solutions must be developed collaboratively to engage fishers in playing a part in maintaining their fisheries and protecting right whales.

The project focused on three approaches to enhancing co-existence: (1) developing an inclusive management/mitigation system, where fishers are involved in early stages of the process to reduce overlap between whales and fisheries in the Gulf of St. Lawrence (in space and in time); (2) conducting research to develop new fishing gear technologies to reduce entanglements or fatalities when fishers and whales are occupying the same area at the same time; and (3) informing fishers, the public, and young people of the importance of conserving marine habitats and resources. As part of the project, the staff at Homarus developed interactive workshops and educational materials for both fishers and the general public to learn about North Atlantic Right Whales, other species at risk, co-existence, and coastal environments.

Deeply connected to local communities, fisheries, and local ecosystems, Homarus offers a much-needed model of ocean literacy that builds bridges between science and society. The Co-Existing With NARW Project is part of a larger initiative named “Clean Oceans” that the MFU created in the 1990s. Clean Oceans encourages fishing communities to be aware of, and take action

to protect, their marine and coastal environments. Through collaboration, scientific research, and education, the Co-Existing With NARW Project emphasizes the importance of developing solutions *by* fishing communities and *for* fishing communities. In what can often become a highly conflictual situation, the project aims to increase trust and participation in management measures through authentic engagement processes that draw on the best available local, expert, and scientific knowledge to co-develop effective solutions. Engaging the community and raising awareness about the marine ecosystem is central to this process because it increases the knowledge required to build trust and involvement in decision making and management measures.

Strengths, Challenges, and Possibilities for Bridging With Formal Education

Each of these four examples of ocean literacy and ocean optimism reflects distinct community responses to local priorities. However, as different as these community projects may be with regard to how they define the parameters of community and the issues they are aiming to address, they nevertheless reflect similar strengths and challenges. Understanding these commonalities is helpful for advancing and sustaining community-based approaches to ocean literacy, and especially for bridging these informal spaces of community learning and the more structured worlds of formal and non-formal education.

While the notion of the ocean continuum reminds us that the ocean shapes and sustains all life on this planet, the most defining commonality between the projects profiled in the four examples is the *lived relationships between people and the coasts/ocean*. Furthermore, through sustained relationships between people and place, the projects draw on and strengthen *place-based knowledge systems*, recognizing that there is a plurality of knowledge systems that can co-exist (Reid et al., 2020). This is particularly exemplified by the practice of *Etuaqtmumk* (Two-Eyed Seeing) that guides Mi'kmaq knowledge holders, fishers, and Western scientists as part of the Apoqnmulti'k project, though the co-existence of plural knowledge systems is apparent across all of the examples. The connection between coastal communities and the ocean continuum is particularly strengthened through *cultural and embodied livelihood practices and values* that connect individuals and communities to the ocean (Engel et al., 2020). While these practices and values may be as distinct as urban Haligonians standing up against systemic racism on their surfboards during Oceans Week Halifax (OWHFX, 2020) or Syrian refugees learning to fish in Petty Harbour, they all offer pathways for collaboration on ocean issues that continue to be undermined by conflict, distrust, and siloed relationships (Ostertag & Ammendolia, 2020).

Across the four examples, *collaboration* emerges as a key to community-based ocean literacy. In particular, this collaboration greatly expands the notion of “community” since, rather than emphasizing similarities (e.g., similar sectors,

economic interests, cultural backgrounds, socio-economic status, etc.), the examples reflect *intersectional* approaches to responding to local priorities by striving to create inclusive spaces for diverse and underrepresented communities of humans and nonhumans (e.g., whales, turtles, eels, salmon, lobster, tomcod) to work together. Furthermore, the cases reflect the significant *role of womxn leaders*, particularly young womxn, in developing intersectional approaches to collaboration. While the ocean (and most fields in science) largely remains a male-dominated space, womxn across Mi'kma'ki/Atlantic Canada are taking action; they are responding to the urgent socio-ecological issues both impacting and being impacted by the ocean. Notwithstanding womxn's efforts to shape and change who comprises the seascape of participants defining ocean narratives and decision making, the "ocean-so-blue" remains an "ocean-so-white." Efforts for *blue justice* (Bennett et al., 2020) that work to increase racial equity, diversity, inclusion, and justice must continue.

In addition to limitations with regard to blue justice, the cases suggest that community-based ocean literacy projects also share common gaps and barriers. As with many community-based projects, particularly in marginalized regions or with underrepresented communities, the single greatest barrier to sustaining and advancing efforts is *lack of funding* (Ostertag & Ammendolia, 2020). Funding cycles are often short-term and competitive; moreover, they frequently lack flexibility and do not reflect the needs of community-based projects that require time and additional support to build and sustain diverse collaborative relationships. Closely related to the barrier of funds is the *barrier of time*, since many projects depend heavily on volunteers dedicating their time to developing, funding, and implementing projects.

The *emergent and responsive* characteristics of these highly diverse projects are essential for community-based projects to respond to local priorities; however, these become additional barriers since determining how to sustain projects over time without institutional frameworks and long-term funding is no easy task. For instance, how can projects be scaled up to influence policy and shape education beyond the local community? Also, since community-based learning is inherently tied to specific communities (e.g., local geographies, languages, cultures, issues), how can community-learning be measured or replicated when it is highly *context-specific*?

In responding to these questions, we suggest rethinking the implications of community-based learning that is emergent, responsive, and context-specific not as barriers but as opportunities. Perhaps the challenge is not to scale up and institutionalize community-based ocean literacy or to develop metrics to assess the learning outcomes of these diverse projects. Instead, the challenge may be to connect these rich, complex, action-oriented learning spaces with formal and non-formal education. Numerous education researchers (Lenton et al., 2014), particularly in environmental education (Elliott et al., 2020), identify the gaps between schools and communities as well as schools and non-formal education

as lost learning opportunities for children, youth, teachers, and communities. There are, however, several barriers to developing connections and forming partnerships between formal education systems and community-based ocean literacy projects. One of the largest barriers to developing community-based ocean literacy collaborations in formal education is the *lack of ocean concepts* in the Atlantic Canadian curriculum (McPherson et al., 2018). For many subjects, the curriculum is already overcrowded, resulting in challenges for teachers to teach the designated topics within the allotted time. Furthermore, ocean literacy, particularly in community contexts, is highly trans-disciplinary and difficult to adapt to a *curriculum structured around subjects and a tightly scheduled school timetable*. These structural barriers are particularly challenging in the high school curriculum, though the shift toward inquiry-based learning in lower grades (e.g., Nova Scotia Department of Education and Early Childhood Development, 2018) offers greater flexibility for connecting broad learning competencies with school-community collaborations.

While McPherson et al. (2018) identify *teachers' lack of adequate subject knowledge* as a barrier to teaching ocean-related curriculum, community-based ocean literacy offers opportunities for teachers to build supportive communities of practice with diverse knowledge holders, experts, and practitioners in the community. Over time, these collaborations can support teachers in deepening their understanding of critical ocean issues, as well as in increasing their level of comfort in effectively communicating these ideas to their students. For students, these collaborations can lead to transformative and empowering learning opportunities by facilitating their engagement with local ocean issues.

Currently, the inclusion of ocean literacy concepts in formal education systems is also significantly limited by a *lack of access* to appropriate resources, including culturally relevant books and textbooks; however, other access barriers include lack of Internet connectivity and cost of transportation to coastal communities where many of these projects take place. Collaboration with community-based initiatives could assist in providing valuable, context-specific resources to teachers, oftentimes bringing these resources right into school settings (e.g., Homarus's mobile lab), especially in more rural areas where access to the aforementioned resources may be particularly scarce. However, while many community-based programs exist, these projects are often not widely accessible or publicized to teachers. Personal relationships with community members involved in local projects may be required to participate in community-based projects, resulting in barriers for teachers who may lack these relationships (for instance, because of high staff turnover, see Roy, 2021 in this issue). The Canadian Ocean Literacy National Strategy's recommendation to coordinate local, provincial, and national ocean literacy initiatives (including community-based projects) through an online "community of practice" digital platform responds to this need to improve schools' and communities' capacities to build relationships and collaborate (Glithero, 2020).

In order for teachers and schools to be collaborators in community-based projects, extensive professional development will be required for pre-service and in-service teachers, as well as for the school administrators and school board members overseeing these activities. Teacher education programs that offer community-service learning opportunities as part of pre-service teacher education are well-positioned to expand their relationships with community-based ocean literacy initiatives (Lenton et al., 2014). Ultimately, community-based approaches to ocean literacy fall within broader calls in environmental education to align formal, non-formal, and community-based education (Elliott et al., 2020; Sauv e & Asselin, 2018). As Elliott et al. (2020) write, involving the wider community in environmental education is important so that teachers and schools do not have to bear the burden alone of preparing the next generation to be responsible stewards of the environment. However, in order to make these changes, schools can no longer operate in isolation from the places where they are located and the communities they serve.

Conclusions

Ocean optimism compels us to learn from examples in which coastal communities have successfully tackled wicked ocean problems (Ardoin et al., 2020; Paasche & Bonsdorff, 2018). These examples offer significant insights that will broaden our understanding and practice of ocean literacy. Whether it is mobilizing a vibrant and diverse ocean community in K'jipuktuk /Halifax, as with OWHFX, using Two-Eyed Seeing as a guiding framework, as in the Apoqmatulti'k project, supporting newcomer women's mental health and community belonging through the Fishing for Success Project, or collaborating with fishing communities, scientists, government, and other partners to support coastal livelihoods and protect endangered North Atlantic Right Whales, these examples share important commonalities. While not an exhaustive list, the strengths of the projects emerge from:

- sustained relationships between people and coasts/ocean;
- the co-existence of plural, place-based knowledge systems, particularly Indigenous knowledges;
- cultural, livelihood, and embodied practices and values connected to the coast/ocean;
- commitments to collaboration, diversity, inclusion, equity, and access; and
- the emerging leadership role of womxn and youth.

Common barriers include blue injustices (e.g., underrepresented communities continue to have limited access to ocean benefits and experience disproportionate impacts of ocean risks) and organizational pressures resulting from a lack of funding and time to sustain and grow projects. However, these

challenges become more complex as we consider bridging community-based learning with formal education, where barriers include:

- lack of ocean content in formal curricula;
- rigid disciplinary structures and timetables;
- teachers' lack of ocean content knowledge and professional development; and
- lack of access to resources, coasts, ocean, and sustained personal relationships with community members.

At their heart, the relational, emergent, responsive, and context-specific nature of these examples reflect both the strengths and challenges of community-based ocean literacy. Fundamentally, the initiatives are exemplary bright lights that we can learn from; however, since these solutions will also need to be emergent and responsive to local contexts, they are not blueprints for replicable or scalable solutions to socio-ecological problems. Rather, they offer examples of intersectional collaborations and opportunities for building bridges between formal education, non-formal education, and informal contexts of community-based social action. And, while each initiative is imperfect and complicated in its own ways, taken together they offer examples of ocean optimism and community-based ocean literacy that allow for different voices to tell new narratives (Lubchenco & Gaines, 2019) for the ocean as we collectively strive to build healthier and more just human–ocean relationships.

Notes

- ¹ Womxn is a term encompassing all women, girls, and femme-identifying persons; it is not restricted to gender binary terminology such as women.
- ² The project is co-led by the following organizations: Unama'ki Institute of Natural Resources (UINR); The Confederacy of Mainland Mi'kmaq, Mi'kmaq Conservation Group (The CMM); Marine Institute of Natural and Academic Science (MINAS); Ocean Tracking Network (OTN); Acadia University; Dalhousie University; and Fisheries and Oceans Canada (DFO). The project is currently funded through a Natural Sciences and Engineering Research Council of Canada (NSERC) Strategic Partnership Grant (SPG). We believe the NSERC SPG has initiated a research program that will grow and flourish, providing critical knowledge long after the current funding cycle is over.
- ³ This Homarus-led project would not be possible without the invaluable collaboration of the follower partners: M-Expertise Marine, CORBO Engineering, Ocean School, Verts Rivages, Cape Breton Environmental Association, Prince Edward Island Fishermen's Association (PEIFA), Oceans North, Association des Crabiers Acadiens (ACA), Nature NB, Marie-France Comeau (artist), Marie Cadieux (artist), Conservation Council of New

Brunswick (CCNB), Fundy North Fishermen Association; and funding from the Species at Risk Nature Fund (DFO).

Acknowledgements

In addition to the project partners listed above, we would like to recognize the contributions of all the individuals and participating organizations who shared their time, knowledge, and passion to make this project possible, including Lisa (Diz) Glithero (COLC), Sarah MacNeil (COLC), Carie Hoover (COLC), Lilia Yumagulova (COLC), Shannon Harding (Clean Foundation), Janet Stalker (Ocean School), Noémie Roy (Marine Affairs, Dalhousie University), Shannon Monk (Sakatay Global), Claudio Aporta (Marine Affairs, Dalhousie University), and Chris Milley (Marine Affairs, Dalhousie University).

This research was approved by Dalhousie University Research Ethics Board, REB #: 2019-4891

References

- Aguilar, O. M. (2018). Examining the literature to reveal the nature of community EE/ESD programs and research. *Environmental Education Research*, 24(1), 26–49. <https://doi.org/10.1080/13504622.2016.1244658>
- Allison, E. H., Kurien, J., Ota, Y., Adhuri, D. S., Bavinck, J.M., Cisneros-Montemayor, A., Fabinyi, M., Jentoft, S., Lau, S., Mallory, T. G., Olukoju, A., van Putten, I., Stacey, N., Voyer, M., & Weeratunge, N. (2020). *The human relationship with our ocean planet*. World Resources Institute. <https://oceanpanel.org/sites/default/files/2020-10/Human%20Relationship%20with%20the%20Ocean%20Full%20Paper.pdf>
- Amaratunga, C. (2019). A social movement in ocean literacy: World ocean day. *Journal of Ocean Technology*, 14(1), 116–117.
- APTN News. (2019, December 19). *Living treaties - Part 1 - APTN Investigates* [Video]. YouTube. https://www.youtube.com/watch?v=y2h_orzCC1s
- Ardoin, N. M., Bowers, A. W., & Gaillard, E. (2020). Environmental education outcomes for conservation: A systematic review. *Biological Conservation*, 241, Article 108224. <https://doi.org/10.1016/j.biocon.2019.108224>
- Balmford, A., & Knowlton, N. (2017). Why Earth optimism? *Science*, 356(6335), 225. <http://doi.org/10.1126/science.aan4082>
- Bennett, N. J., Blythe, J., White, C., & Campero, C. (2020). *Blue growth and blue justice* (IOF/UBC Working Paper #2020-02). Institute for the Oceans and Fisheries, University of British Columbia. https://fisheries.sites.olt.ubc.ca/files/2020/06/Take2-2020-02-WP_Blue-Growth-and-Blue-Justice-IOF-Working-Paper.pdf
- Bigelow Laboratory for Ocean Sciences. (2019, May 29). Climate driving new right whale movement. *ScienceDaily*. Retrieved November 11, 2020 from www.sciencedaily.com/releases/2019/05/190529084828.htm

- Choudry, A., & Shragge, E. (2011). Disciplining dissent: NGOs and community organizations. *Globalizations*, 8(4), 503-517. <https://coco-net.org/disciplining-dissent-ngos-and-community-organizations/>
- Cvitanovic, C., & Hobday, A. J. (2018). Building optimism at the environmental science–policy–practice interface through the study of bright spots. *Nature Communications*, 9, Article 3466. <https://doi.org/10.1038/s41467-018-05977-w>.
- Denny, S. (2020, October 14). Making room for Mi'kmaw livelihood fishery easier than you think. *The Chronicle Herald*. https://www.thechronicleherald.ca/opinion/local-perspectives/shelley-denny-making-room-for-mikmaw-livelihood-fishery-easier-than-you-think-509373/?fbclid=IwAR2DuFa6kiYqJlXoFIHCh_CHTNn5FiomijNleqOCm07ryQV8UiSgillLDqBY#.X4rnFWozPPw.mailto
- Elliott, P., Dueck, C., & Rodenburg, J. (2020). Activating teacher candidates in community-wide environmental education: The Pathway to Stewardship and Kinship project. *Canadian Journal of Environmental Education*, 23(1), 85–101.
- Engel, M., Vaske, J. J., & Bath, A. J. (2020). Value orientations and beliefs contribute to the formation of a marine conservation personal norm. *Journal for Nature Conservation*, 55, Article 125806. <https://doi.org/10.1016/j.jnc.2020.125806>
- European Commission. (2013). *Galway Statement on Atlantic Ocean Cooperation: Launching a European Union - Canada - United States of America Research Alliance*. https://ec.europa.eu/research/iscp/pdf/galway_statement_atlantic_ocean_cooperation.pdf
- Gardiner, B. (2020, July 16). Ocean justice: Where social equity and the climate fight intersect. *Yale Environment 360*. https://e360.yale.edu/features/ocean-justice-where-social-equity-and-the-climate-fight-intersect?fbclid=IwAR1a94N_8aAHxygoPaVAjWtkAJFWbHmKCPIOF_ZSU7bZ4vU5_iMnP4xRMw
- Glasgow Caledonian University [watchgu]. (2020, September 30). *Intersectionality and climate justice: An emancipatory research agenda* [Video]. YouTube. <https://www.youtube.com/watch?v=8tRpxaTHWMw>
- Glithero, L. (2020, June). *Understanding ocean literacy in Canada: National Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/08/COLC_National-Report_Final_2020.pdf
- Glithero, L., MacNeil, S., Scully, S., & Stalker, J. (2020). Sharing our stories to co-create a national ocean literacy strategy. *Journal of Ocean Technology*, 15(1), 29–38.
- Gough, A. (2017). Educating for the marine environment: Challenges for schools and scientists. *Marine Pollution Bulletin*, 124(2), 633–638. <https://doi.org/10.1016/j.marpolbul.2017.06.069>
- Guest, H., Lotze, H. K., & Wallace, D. (2015). Youth and the sea: Ocean literacy in Nova Scotia, Canada. *Marine Policy*, 58, 98-107. <https://doi.org/10.1016/j.marpol.2015.04.007>
- Haghighi, S. (2019, November). Women sharing heritage program, Association for New Canadians. *Immigrant and Refugee Mental Health Project - Promising Practice e-Newsletter*. <https://irmhp-psmir.camhx.ca/e-newsletter/promising-practices/november-2019>
- Held, M. (2018, August 7). Fish-WIKS PhD student Mirjam Held presents at CaNOE Ocean Literacy conference. *FISH-WIKS NEWS, Dalhousie University*. Retrieved October 21, 2020, from https://www.dal.ca/sites/fishwiks/news-events/2018/08/07/fish_wiks_phd_student_mirjam_held_presents_at_canoe_oceans_literacy_conference.html

- Humphreys, J. (2019, January 8). In despair over climate change? Try 'active hope.' *The Irish Times*. <https://www.irishtimes.com/culture/in-despair-over-climate-change-try-active-hope-1.3738187>
- Johns, L. N., & Jacquet, J. (2018). Doom and gloom versus optimism: An assessment of ocean-related U.S. science journalism (2001–2015). *Global Environmental Change*, *50*, 142–148. <https://doi.org/10.1016/j.gloenvcha.2018.04.002>
- Kelley, R. D. G. (2002). *Freedom dreams: The black radical imagination*. Boston: Beacon Press.
- Kelly, C. (2018). 'I need the sea and the sea needs me': Symbiotic coastal policy narratives for human wellbeing and sustainability in the UK. *Marine Policy*, *97*, 223–231. <https://doi.org/10.1016/j.marpol.2018.03.023>
- Kelsey, E. (2016, June 8) The rise of ocean optimism: Sharing uplifting news of resilience and recovery fuels hope. *Hakai Magazine*. Retrieved August 18, 2020 from <https://www.hakaimagazine.com/features/rise-ocean-optimism/>
- Kelsey, E. (2021, January 18). An antidote for environmental despair: When it comes to conservation, hope is much more useful than gloom. *Hakai Magazine*. Retrieved January 19, 2021 from <https://www.hakaimagazine.com/features/an-antidote-for-environmental-despair/>
- Knowlton, N. (2019). Earth optimism – recapturing the positive. *Oryx*, *53*(1), 1–2. <https://doi.org/10.1017/S0030605318001333>
- Kwauk, C. (2020). *Roadblocks to quality education in a time of climate change*. Center for Universal Education at Brookings: <https://www.brookings.edu/wp-content/uploads/2020/02/Roadblocks-to-quality-education-in-a-time-of-climate-change-FINALpdf?fbclid=IwAR1jEURYgyZJYiy7K5rbLjYGbswu8mAz2HkpxwspVjpRFohqVl8eQDCfXM>
- Landry, N., Gifford, R., Milfont, T.L., Weeks, A., & Arnocky, S. (2018). Learned helplessness moderates the relationship between environmental concern and behaviour. *Journal of Environmental Psychology*, *55*, 18–22. <https://doi.org/10.1016/j.jenvp.2017.12.003>
- Lenton, R., Sidhu, R., Kaur, S., Conrad, M., Kennedy, B., Munro, Y., & Smith, R. (2014). *community service learning and community-based learning as approaches to enhancing university service learning*. Toronto: Higher Education Quality Council of Ontario.
- Liboiron, M., Liboiron, M., Ammendolia, J., Winsor, K., Zahara, A., Bradshaw, H., Melvin, J., Mather, C., Dawe, N., Wells, E., Liboiron, F., Fürst, B., Coyle, C., Saturno, J., Novacefski, M., Westscott, S., & Liboiron, G. (2017). Equity in author order: A feminist laboratory's approach. *Catalyst: Feminism, Theory, Technoscience*, *3*(2), 1–17. <https://doi.org/10.28968/cftt.v3i2.28850>
- Lubchenco, J. & Gaines, S. D. (2019). A new narrative for the ocean. *Science*, *364*(6444), 911. <https://doi.org/10.1126/science.aay2241>
- Martin, J. A., Gray, S., Aceves-Bueno, E., Alagona, P., Elwell, T. L., Garcia, A., Horton, Z., Lopez-Carr, D., Marter-Kenyon, J., Miller, K. M., Severen, C., Shewry, T., & Twohey, B. (2019). What is marine justice? *Journal of Environmental Studies and Sciences*, *9*(2), 234–243. <https://doi.org/10.1007/s13412-019-00545-0>
- McAfee, D., Doubleday, Z. A., Geiger, N. & Connell, S. D. (2019). Everyone loves a success story: Optimism inspires conservation engagement, *BioScience*, *69*(4), 274–281. <https://doi.org/10.1093/biosci/biz019>
- McPherson, K., Wright, T., & Tyedmers, P. (2018). Examining the Nova Scotia science curriculum for international Ocean Literacy Principle inclusion. *International Journal*

- of Learning, Teaching and Educational Research, 17(11), 1–16. <https://doi.org/10.26803/ijlter.17.11.1>
- National Oceanic and Atmospheric Administration (NOAA). (2013, March). *Ocean Literacy: The essential principles and fundamental concepts of Ocean Sciences for learners of all ages* (version 2). <https://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf>
- North American Association for Environmental Education (NAAEE). (2017). *Community engagement: Guidelines for excellence*. https://cdn.naaee.org/sites/default/files/eeepro/resource/files/community_engagement_-_guidelines_for_excellence_0.pdf
- Nova Scotia Department of Education. (2015). *Oceans 11 Outcomes*. [https://curriculum.novascotia.ca/sites/default/files/documents/outcomes-indicators-files/Oceans 11 Outcomes %282015%29_0.pdf](https://curriculum.novascotia.ca/sites/default/files/documents/outcomes-indicators-files/Oceans%2011%20Outcomes%202015%29_0.pdf)
- Nova Scotia Department of Education and Early Childhood Development. (2018). *Capable, confident, and curious: Nova Scotia's Early Learning Curriculum Framework*. <https://www.ednet.ns.ca/docs/nselcurriculumframework.pdf>
- Österblom, H., Wabnitz, C. C. C., & Tladi, D. (2020). *Towards ocean equity*. World Resources Institute. <https://www.oceanpanel.org/blue-papers/towards-ocean-equity>
- Ostertag, J., & Ammendolia, J. (2020, June). *Understanding Ocean Literacy in Canada: Atlantic Regional Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/07/Atlantic-Regional-Report_Final.pdf
- OWHFX. (2020). 2020 Oceans Week HFX Events. Retrieved October 15, 2020, from <http://www.oceansweek.ca/2020-events-oceans-week-hfx>
- Paasche, Ø., & Bonsdorff, E. (2018). The wicked ocean. *Ambio*, 47(3), 265–268. <https://doi.org/10.1007/s13280-017-1000-0>
- Paraskeva-Hadjichambi, D., Goldman, D., Hadjichambis, A. C., Parra, G., Lapin, K., Knippels, M.-C., & Van Dam, F. (2020). Educating for environmental citizenship in non-formal frameworks for secondary level youth. In A. C. Hadjichambis, P. Reis, D. Paraskeva-Hadjichambi, J. Činčera, J. Boeve-de Pauw, N. Gericke, & M.-C. Knippels (Eds.), *Environmental Discourses in Science Education: Vol 4. Conceptualizing environmental citizenship for 21st century education* (pp. 213–235). Springer. https://doi.org/10.1007/978-3-030-20249-1_14
- Reid, A. J., Eckert, L. E., Lane, J.-F., Young, N., Hinch, S. G., Darimont, C. T., Cooke, S. J., Ban, N. C., & Marshall, A. (2020). “Two-Eyed Seeing”: An Indigenous framework to transform fisheries research and management. *Fish and Fisheries*, 22(2), 243–261. <https://doi.org/10.1111/faf.12516>
- Reilly, R. C. (2010). Participatory case study. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (Vol 2, pp. 659–661). Sage Publications, Inc. <https://www.doi.org/10.4135/9781412957397.n247>
- Santoro, F., Santin, S., Scowcroft, G., Fauville, G., & Tuddenham, P. (2017). *Ocean literacy for all: A toolkit* (IOC Manuals and Guides, 80). IOC/UNESCO & UNESCO Venice Office. <https://unesdoc.unesco.org/ark:/48223/pf0000260721>
- Sauvé, L., & Asselin, H. (2018). *Stratégie québécoise d'éducation en matière d'environnement et d'écocitoyenneté*. Les Éditions du Centr'ERE, Université du Québec à Montréal. <https://www.coalition-education-environnement-ecocitoyennete.org/wp-content/uploads/2019/07/Strategie-Edition-complete.pdf>

- Serani, D. (2008). If it bleeds, it leads: The clinical implications of fear-based programming in news media. *Psychotherapy and Psychoanalysis*, 24(4), 240–250.
- Stewart, A. E. (2019). Ocean Literacy Matters in Canada. *Journal of Ocean Technology*, 14(2), 112–121.
- TEDx Talks. (2018, August 14). *Fishing for Success: Casting a Net for a Better Future* | Kimberly Orren | TEDxStJohns [Video]. YouTube. <https://youtu.be/Mi9so8FHZy4>
- U.S. Commission on Ocean Policy. (2004). Promoting lifelong ocean education. In *An Ocean Blueprint for the 21st Century: Final Report* (pp. 122–146). https://govinfo.library.unt.edu/oceancommission/documents/full_color_rpt/08_chapter8.pdf
- Verma, J. T., Bavington, D., & Orren, K. (2020, April 10). Commentary: How and why we fish (Part 2). *The Independent*. <https://theindependent.ca/2020/04/10/commentary-how-and-why-we-fish-part-2/>
- Walter, P. (2020). Adult Environmental Education. In T. Rocco, M. C. Smith, R. C. Mizzi, L. R. Merriweather, & J. D. Hawley (Eds.), *Handbook of Adult and Continuing Education* (pp. 314–321). Sterling, VA: Stylus Publishing.
- Zachariou, A., & Symeou, L. (2009). The local community as a means for promoting education for sustainable development. *Applied Environmental Education and Communication*, 7(4), 129–143. <https://doi.org/10.1080/15330150902744152>

Poetic Questioning, Ocean Gratitude

Robi Smith, Vancouver, British Columbia



From the outset, I imagined this piece as a mixed media painting of an underwater rocky shoal that, as the project progressed, would become filled with fish, sea stars, anemones, floating jellies, and more. Before COVID-19 hit, my intention was to create the background painting on wood panels and then cut out myriad paper shapes of sea creatures. I would invite people to choose a creature, colour it in, and write their responses to the question: “If you and the ocean spoke the same language, what would you say to each other?” Together, we would embed their creature response into the painting.

When the need for physical distancing meant not being able to host face-to-face encounters, I put the challenge out through my website and virtual networks. I posted an image of the background painting and asked the above question. I solicited responses from my e-newsletter subscribers, Facebook, and Instagram communities. I also boosted my Facebook post to reach more people in communities up and down the Pacific coast. As I received responses, I painstakingly painted the words onto the painting and added sea creatures throughout.

The responses I’ve received are poetic, questioning, thoughtful, apologetic, deeply personal, and meditative. They include remembered stories and imaginings of what could be. The act of slowly painting the responses onto the artwork has left me feeling both deeply moved and strongly connected to my fellow humans and ocean lovers. Creating the imagery that surrounds the words is a celebration of the beautiful biodiversity that lives just below the surface of our coastal waters here in British Columbia. I have always felt blessed to live here, now more than ever.

Contributing participant, Joann, from Burnaby, British Columbia shared:

I already know we speak the same language. So do we all—that’s a given! Humans have always known the ocean’s language. These days, though, they have to re-learn it because some of them forget. In another way—I would ask the ocean why it sent

me the salmon as a messenger. Of course, I already know the answer. Humans need a messenger from another world to understand the other world. An intermediary. An emissary from the deep to teach us about relationships. Between sweet water and salt water. Between land and sea. Between them and us. Between humans and their food. Between other species and their food. Between the land world and the water world. To be totally astounded by this iconic creature and its giving energy. A Rabbi once told me that Jewish people believe fish offer teachings from the “bigger picture.” Water is the “bigger picture.” If you understand water, you understand everything. And fish, unlike humans, cannot change their environment. Without a watery home, a fish dies. (Celia, Vancouver, contributor)

If I were to say something to the ocean it would be “thank you” on so many levels. Like the fact that just seeing the ocean has a calming effect on me, that it’s home to more life than anywhere else on earth, that life on earth originated from its watery depths, or that the phytoplankton produce much of the oxygen we breathe today. Basically, the ocean is life and for that we should all be thankful. (Sarah, Vancouver, contributor)

Be still my beating heart. Ocean. You are immense, intense, calming, thunderous, joyful, playful, dangerous. Your scent clears my mind and sends visions of soft sand, seashells, driftwood, kelp, and birds. You are human lifeline. I am grateful.

The Many Currents of Ocean Literacy: A Case Study of Ocean Wise Programming

Maria Albuquerque & David B. Zandvliet, Simon Fraser University, Canada

Abstract

Recent scientific studies demonstrate conclusively that our planet faces an ocean crisis and efforts to mitigate this crisis should be addressed urgently. As many species are lost to extinction, conservation steps need to be taken and are indicated by targets such as those outlined by the 2030 Agenda for Sustainability and Development. Similarly, a clear agenda for ocean education should be encouraged as the first step toward broader conservation goals. Recently, the concept of ocean literacy has been described as a way to help communities and individuals develop a more holistic understanding of their influences on the ocean and the ocean's influences on their lives. Still, ocean literacy has not yet been fully enacted in the K-12 curricula in Canada, and many environmental education programs are taking the lead to provide program participants with a broader understanding of the term. In this study, we provide a broad overview of ocean literacy initiatives as enacted by the Ocean Wise NGO. We examine how these have influenced the diffusion of ocean literacy in British Columbia. In our paper, we include a case study highlighting the diversity of Ocean Wise programs to provide a broad view on activities from the perspective of program participants. We selected a range of education programs for data collection, including school visits to the Vancouver Aquarium, off-site mobile programming (with AquaVan), and teacher professional development programs, both on-site and via an online learning platform. We explore what each initiative offers students with regard to connection to the ocean. Through an instrumental case study design, we combine qualitative approaches with observations, focus groups, and interviews to describe many currents of ocean literacy flowing from Ocean Wise and its broad and diverse ocean literacy programming.

Résumé

Des études scientifiques récentes montrent de façon concluante que notre planète est en pleine crise océanique et qu'il est urgent d'agir. De nombreuses espèces sont vouées à l'extinction; des mesures de conservation doivent être prises pour respecter les cibles fixées, notamment dans le Programme de développement durable de l'ONU, qui définit des objectifs pour 2030. Pour atteindre ces objectifs généraux de conservation, nous avons besoin d'un programme sur la connaissance de l'océan. Ce concept, plutôt récent, est défini comme un outil pour enseigner aux communautés et individus une compréhension holistique de leur influence sur l'océan et de l'influence de l'océan sur leurs vies. Cependant, la connaissance de l'océan n'est pas encore complètement intégrée au programme scolaire canadien de la maternelle à la 12^e année. De nombreux programmes d'éducation relative à l'environnement prennent toutefois les devants et expliquent ce terme dans le cadre

de leurs activités. Dans la présente étude, nous brossons un portrait global des initiatives de connaissance de l'océan mises en œuvre par l'ONG Ocean Wise. Nous examinons l'influence de ces initiatives sur la diffusion de la connaissance de l'océan en Colombie-Britannique. Notre étude de cas souligne la diversité des programmes d'Ocean Wise, le but étant de donner un aperçu général des activités selon le point de vue des participants au programme. Pour la collecte de données, nous avons sélectionné différents programmes éducatifs, notamment des visites scolaires à l'Aquarium de Vancouver, des programmes mobiles (avec AquaVan), ainsi que des programmes de perfectionnement professionnel des enseignants, offerts tant en milieu de travail que sur des plateformes d'apprentissage en ligne. Nous explorons également les enseignements sur la relation avec l'océan que les élèves retirent de chaque initiative. Notre étude de cas instrumentale combine approches qualitatives, observations, groupes de discussions et entrevues pour cerner les nombreux courants de la connaissance de l'océan provenant d'Ocean Wise, de même que la variété de ses programmes d'éducation sur ce thème.

Keywords: ocean literacy, marine education, environmental education, place-based education

Mots-clés : connaissance de l'océan, éducation relative à l'océan, connaissance de la mer, éducation relative à l'environnement, éducation axée sur les réalités locales

Introduction

The ocean plays a major role in defining key features of the Earth and is home to between one and two million different species. Humans' relationship with the ocean goes beyond a simple source of food and resources. For example, the enormous mass of water around the globe influences the planet's climate, weather, biodiversity, and ecosystems. Currently, our ocean system is threatened by many unsustainable human activities, such as plastic pollution, overfishing, and increasing levels of carbon dioxide, causing ocean acidification and changes in water temperatures (International Union for Conservation of Nature [IUCN], n.d.) While practical solutions are being discussed and implemented, environmental awareness through ocean education should be the first step to mitigate human impacts on the environment and ocean system. According to Santoro et al. (2017), changes in the way we think about and understand our relationship with the ocean can be addressed by a focus on ocean literacy, which they defined as "an understanding of the ocean's influence on you and your influence on the ocean" (p.15). When learners become ocean literate, they understand their relationship with a complex web that links humans with a diversity of other organisms that also rely on the ocean.

Education is the most important tool available to support the growth of ocean literacy, yet most North American schools do not include this as part of their learning outcomes (Guest et al., 2015). Bringing an ocean literacy approach to schools can engage learners in experiences with marine ecosystems and may impact our personal connections to the ocean. To become truly ocean literate, individuals need to be empowered with knowledge and further inspired by direct experiences (Wharton et al., 2019). These experiences provide meaningful reference points when exploring ocean topics so that knowledge becomes associated with behaviour change and a more caring attitude toward the marine environment. Real-world experiences develop animal empathy, ocean appreciation, and long-lasting learning moments (Wharton et al., 2019). If we teach students about the ocean in the early years of school, this may increase their potential to foster deep and lasting appreciation of the ocean.

Children are especially open to new and exciting ideas as well as to improving their connection with marine environments and its living dwellers. This type of connection nurtures a sense of caring and ocean stewardship (Blenkin & Kelly, 1994; Bruce, 2004; Joyce, 2013; Joyce et al., 2019). Direct experiences in nature benefit not only students but also the local community who may also become more encouraged to caring, sharing, and understanding their relationship with the natural environment. However, these characteristics have not yet been described in the context of ocean literacy. As stated by Joyce et al. (2019), “educators need to make learning about the ocean an experience which is not only intellectual but also, and perhaps more importantly, emotional” (Seamon, 1984; Bogner, 1998)” (p. 172).

Conceptual Frameworks

In combining ocean literacy with an experiential learning perspective (Kolb, 1984), we understand that learning is a process grounded in experiences by transactions between the person and the environment. Our study is grounded in the conviction that place-based ideas about learning are central to experience. The notion of a place-based education was described by Sobel (1993, 1996), whose ideas were then expanded by others (Gruenwald, 2003; Orr, 1992, 1994; Thomashow, 1996; Woodhouse & Knapp, 2000). Describing exactly what constitutes place-based education becomes clouded partly due to the multifaceted and interdisciplinary nature of the literature where this notion seems to reside. Gruenwald (2003) writes that the idea of place-based learning connects theories of experiential learning, contextual learning, problem-based learning, constructivism, outdoor education, Indigenous education, and environmental education. Connecting ocean literacy to an experiential and place-based learning framework is also a central idea in British Columbia’s (B.C.) framework for environmental education (B.C. Ministry of Education, 2007).

This study aims to contribute to the broader agenda on ocean literacy in B.C. and across Canada by connecting it to the larger environmental education discourse. Ironically, Canada is surrounded by three oceans and has the world's longest coastline; yet, ocean education is only a compulsory course in two provinces—Nova Scotia and Prince Edward Island (McPherson et al., 2018). Importantly, the ocean is also associated with the overall well-being of all Canadians (Canadian Ocean Literacy Coalition, 2019). In a series of recent reports, the Canadian Ocean Literacy Coalition (COLC) gathered data on current understandings of ocean literacy as part of a strategy to improve and increase ocean awareness across the country. COLC research “will lead to a better understanding of Canadians’ relationship(s) with the ocean, different approaches and challenges to ocean literacy, and effective ways to promote positive ocean actions” (COLC, 2019). This is important as most previously published studies on ocean education and programming originate from the United States (Mogias et al., 2019). Without more published studies on ocean education in Canada, it becomes difficult to evaluate, learn, and improve on our current programs and curricula aimed at fostering ocean literacy.

Meaningful collaborations among ocean/marine educators, researchers, and communities are foundational to promoting a healthy ocean (Fortner, 2019). Ocean education programs can facilitate direct interactions with the ocean and its wildlife, and these experiences influence in students’ pro-environmental attitudes and the connections to the environment (Myers & Saunders, 2002; Wharton et al., 2019). In B.C., several environmental education programs incorporate ocean education through hands-on experiences, both in the K–12 environment and through informal education programming. Some initiatives also provide professional development for teachers and leadership development opportunities across a broad spectrum of programs. For our study, we focused on the special case of Ocean Wise as a unique context that offers programming in all of these areas.

The “Ocean Wise” Context

Ocean Wise is a global conservation organization based out of the Vancouver Aquarium, which is located in B.C. Ocean Wise’s mission is to inspire the global community to become “ocean wise: by increasing its understanding, wonder, appreciation, and stewardship of our oceans.” It fulfills this mission via four key pillars— engagement, aquarium management, education, and research. As part of a rebranding in 2017, the Vancouver Aquarium launched a website (<https://ocean.org/>) that aims to be a storytelling hub that transcends international borders. The site shares information about ocean related issues, such as overfishing, climate change, urban development, and pollution. It also describes how these contribute to disturbing the natural balance in the ocean realm. A press release about this transition to the brand Ocean Wise stated:

When the Vancouver Aquarium was deciding on what to call this new, global conservation initiative focused on an international audience of ocean and nature lovers, Ocean Wise was a natural choice. Our name is the shortest expression of our story. (Ocean Wise, 2018)

The Vancouver Aquarium is a long-standing institution that has been an education leader in ocean conservation through sustainability and education for more than 60 years. The organization offers a broad range of programming for youth, the general public, K–12 schools, and teachers in B.C. With its long history as an educational leader and its broad range of programming, Ocean Wise offered us a unique and ideal context for an in-depth case study.

Research Problem and Methodology

To date, there are few studies that explore how ocean literacy programs are reaching their goals within the community and within participating classrooms (Fauville, 2019; Fortner, 2019). The limited number of studies about marine issues in the fields of education limits our potential to improve the range and quality of ocean education programming (Fauville, 2019). A more in-depth understanding of how programs are performing would encourage broader discussion and reflection on the lessons and challenges that current ocean literacy programs face and how these should be addressed in the future.

We selected a case study methodology for a variety of reasons. This method has been described as ideal when a holistic, in-depth investigation is needed. For our purposes, we deemed that an exploratory and instrumental approach would best suit the study context of Ocean Wise (Yin, 2018; Stake, 1995). What is more, case studies tend to be selective, focusing on a few issues that are considered fundamental to understanding the system (or program) under study. The main line of inquiry for this research (for all selected programs) focused on the following research questions:

- How are the programs generally perceived by students and/or teachers?
- Do the programs' activities inspire or motivate students to become ocean literate? (If so, how?)
- Do the programs allow for local/community/individual interpretations of ocean literacy?

We considered non-experimental phenomena “in-context” for our study (Kostoulas, 2010; Leavy, 2017; Yin, 2018). In addition, the development of the case study allowed us to develop a complete understanding of a process, program, event, or activity and had further potential to yield insight into and in-depth understandings of Ocean Wise programming.

Methods

The richness of the study lies in the strength of the research methods themselves. Our aim was to produce deep and descriptive data from the programs through semi-structured interviews and observations. A wide variety of Ocean Wise programming was studied, including detailed observations of an “in-school” visit of the mobile AquaVan program at a local elementary school. We made further observations during an elementary school field trip (on-site) at the Vancouver Aquarium. Additional data collection came from focus groups with participating students (from school and university classrooms) as well as from email communications with supervising teachers. In summary, qualitative methods of data collection included researcher field notes, participant observation, and open-ended questions in a questionnaire and during the focus groups.

Data Collection and Analysis

To gather the data for this study, we were present throughout the Ocean Wise program to build a positive relationship with the teachers, students, and student-teachers. As Stake (1995) stated, “observations work the researcher toward greater understanding of the case” (p. 60). We focused primarily on the interactions between the students and the program activities, as well as on the students’ reactions to these activities. After making our observations, we adjusted our questions for the focus groups and questionnaires with both methods helped us better comprehend the program. Importantly, the global pandemic COVID-19 in the midst of our study affected the direction of our research with regard to our ability to follow up with participants and teachers in a face-to-face manner. Moreover, some programs that we had intended to study were suspended because of Provincial Health and Safety orders. Despite the challenges, we collected sufficient data to come to a broader understanding of how Ocean Wise programming functions and to understand the programming’s potential influence on participants’ ocean literacy. We continue now with a description of how the case study unfolded. In the course of this description, we interact with a variety of forms (or *currents*) of ocean literacy programming. The analysis was done by triangulation of our results from the field notes, focus groups, and responses from open-ended questionnaires.

Ethical Considerations

Prior to our data collection methods (observation, focus groups), all participants were informed about the purpose of the study and their voluntary participation. In some cases, this information was provided by classroom teachers (for

elementary students), and written and informed consent was obtained from parents and the local school district. For adult participants, consent procedures were in accordance with institutional and national guidelines, and our study underwent a full ethics review.

Results

Ocean Wise Mobile Programming (the AquaVan)

The AquaVan is a mobile ocean literacy program that brings Ocean Wise programming directly into schools and communities through the transport of a curated collection of live organisms and preserved specimens (e.g., live aquaria, whale skeletons, sea otter fur). The collection is accompanied by an experienced Ocean Wise education team and aquarium staff who care for the live collections when travelling.

Our study begins at a small elementary school in Chilliwack, B.C.— a school that had arranged to have a day-long AquaVan program delivered as part of their school wide environmental programming efforts. The city of Chilliwack is located approximately 100 kilometres inland from the coast. It is common for students attending an inland school to have never visited the ocean. Still, viewing salmonids and other marine species is a common occurrence in the nearby Fraser River. While Chilliwack is distant from the sea, the ocean still brings a range of important economic, cultural, and social impacts to the community (Waddington, 2017). Participants in the research included students in Grades 3 to 6, teachers from School District 33 (Chilliwack), and Ocean Wise leaders who worked to deliver the program.

We observe the program activities with four different cohorts of classes. The lessons are enacted in the school's gymnasium with four program leaders on site. Each leader is responsible for leading an "ocean station," each of which focuses on an ocean theme: Cetaceans (bones and krill); Fur and Pinnipeds (representing sea otters, sea lions, seals); Plastic and Sea Animals; and Live Aquaria, such as sea stars, sea urchins, sea anemones, an assortment of snails and fishes (some with touch pools). The leader announces that all of these stations include samples from the Salish Sea, and that they are found near downtown Vancouver. Classes participated in the activities for one hour, and we conducted observations on eight classes (using two observers).

The briefing activity begins with leaders and students coming together in a large circle. The leader tells stories about the ocean and invite the children to participate. They introduce why the ocean is important to them and also how the health of marine lives is being threatened. One of the leaders subdivides the large group into four smaller groups. Each is directed to one of the themed stations. The groups spend 20 minutes at each station with a different leader. Students listen to stories and lessons related to each station theme. They are invited to ask questions and share stories about the ocean and what they are learning.

At the Fur and Pinnipeds station, one leader talks about a food chain that links the kelp forest to the sea otter (who feed on sea urchins) and asks what would happen if one of these animals (the otters) were no longer there: “That is how a species can go extinct,” says the leader (referring to the relationship between kelp, urchins and sea otters). She also shares that kelp is found in our medicine and our food, so it is good not only for sea animals but for “everyone.” Students then touch the sea otter fur. “Sea otters get old just like us, they will get white hair,” says the leader and then, touching a specimen of sea urchin, states, “You will see a live one today.” One of the students responds with, “This is such a good school day!”

At the Cetacean station are several artifacts —cervical bones from a grey whale and an orca’s jaw. As the children are from Grades K–4, the leaders incorporated more storytelling. They use body movements to mimic whales feeding. Students are welcome to touch the samples and are surprised by the size of the grey whale vertebra: “Oh my God, this is the biggest thing I could see from an animal today!” says one student. The students are observed comparing their own vertebrae by rubbing a classmate’s back. It is interesting to note a sort of discomfort with students as they are told to touch the samples. “Ugh, this is gross!” says one while touching the orca’s teeth and grey whale’s baleen. The leader explains the difference between the specimens and how the structures relate to the diet for each.

At the Plastic and Sea Animals station, students are very talkative. They share examples of how their lives are related to plastic. The session includes a turtle shell and a photo album with animals who had ingested plastic into their bodies. The leader asks, “What do you see in a healthy ocean?” One student answers, “No plastic, colourful fish, clean water.” Another shares, “When I was in Mexico I saw a bottle of water in the ocean and I tried to get it with my sister.” To close the session, after first talking about seafood, the leader then discusses the use of fishing lines and nets and asks which one would bring the lowest impact to marine lives.

Last is an interactive station—Live Aquaria—where students walk around a series of small aquaria. Using stories, the leader invites students to mimic the movements of the animals inside the aquaria. The excitement begins when the leader tells students that they will be touching the animals. The leader invite them to use their little finger to touch the animals. The leader also explains that the animals are alive and can feel their touch so they need to be gentle. The leader gives special emphasis to the sea urchin, explaining the importance of sea urchins’ feet: “It is like having eyes on your feet,” says the leader. The leader shares that the tube feet help pull the urchin along and are the most sensitive part of the sea urchin, helping the sea urchin to sense its surroundings. As students touch the sea urchin, they make such remarks as, “It is so soft! I can’t believe it doesn’t hurt” while others agree, “Yes, it is very soft!”

After students complete the tour of stations (around 45 minutes to one hour), they return to the large circle for a program debrief. The leader wraps up the program by asking students how much they learned and if they liked the tour. Students share their comments out loud and ask further questions. The leader proposes a final “Hi 5 Challenge,” indicating they should share what they learned in the activity with five people they know. Overall, students are participative, and few are left out during the conversations with leaders. No prior knowledge is required for the program and it seems that for many students, this is their first time learning about ocean topics. In one hour, the program touches on many content areas and the structure helps the leaders to fit all the content into one dynamic flow. As observers, we try to narrow the amount of activity down to one word, and we land on the word “intense.”

Focus Groups

After the program, we conducted two focus groups with a subset of the participants; each group included six students from the same class. The first focus group comprised younger children (Grades 2 and 3), and the second was composed of older children (Grades 4 and 5). Having age-defined groups helped students to feel more comfortable and encouraged them to speak freely. We arranged for a studio space for the conversations with couches and comfortable chairs so that they wouldn’t feel they were in a formal setting, and we provided snacks. The students were also welcome to come and go any time they wished. Focus questions were the same for each group, though we adapted the vocabulary for the younger set to make it age-appropriate. To create dialogue, we began by posing open-ended questions to the students. We clarified for students that this was an open space where they could say anything they wanted about their learning and that their comments would be kept private (no names). The conversations lasted approximately 45 minutes each. Below are the highlights from the focus group transcripts.

Interviewer: “What is your favourite thing from the activity today and how is it different from your classes?”

Salmon: “Live animals—you never see animals in school.”

Blue whale: “Seeing the starfish and touching it.”

Blue whale: “I also like to touch myself during the animals’ movements we had to mimic.”

Oyster: “Yes, I like to touch the sea urchin’ spines it didn’t feel spiky only if you press it hard ... to protect from other animals.”

Oyster: “Because I don’t know how to swim, I see things that I can’t see in the water.”

Sea Lion: “We never bring nature to class, we always go there”

Interviewer: Really? Where? Sea Lion: “Close to the school around here.”

Turtle: "See live animals and the history of the animals."

Kelp, Bear, Squid: "Real life animals, like starfish."

All: "Touch live animals."

Interviewer: "What was your least favourite activity today?"

Blue whale: "I didn't really like touching the skeleton of the animals, like the shark jaw. ... And the water was too cold to touch the animals."

Salmon: "I hate the fact that there were no games. ... It is a gym, it's supposed to have games ... and it was way too long. We had no time for recess."

Everybody agrees

Sea Lion: "Touching the sea urchin. I would prefer to see the animals in the nature, not at the school."

Shark: "I like everything!"

Polar Bear: "I didn't like the whales section. It was kind of gross..."

Squid: "The turtle shelf."

Polar Bear: "It is very sad to know how animals are dying from pollution..."

Most students: "The whale section skeleton."

Interviewer: "What was new for you today?"

Oyster: "I have seen seals before in the aquarium only time in my life I saw live seals, but I never touched it. I thought their fur was thick and not smooth. When I touched it today was sooo smooth and beautiful. They are lucky to have that hair."

Shark: "Yeah, that's right, it was shiny and smooth."

Oyster: "My leader said that sea otters are like us, they turn their hair blond/white when they get old. I didn't know they were similar to us like that."

Blue whale: "I saw seals when I was going to Victoria in the ferry. But I didn't know about the fur... I didn't know we could swim inside a whale ... and how they eat is new to me—with the big mouth they eat such tiny animals."

Sea Lion: "I have never touched a starfish and fishes before. It is very nice."

Salmon: "Yeah they were in that small cup like little shrimps."

Sea Lion: "Krill!"

-Students start to imagine themselves in a whale's mouth and them escaping through their blowhole. Some were making fun of going out through their second hole.

Sea Lion: "Seals fur (is) waterproof—black oil for the fur."

Turtle, Dolphin and Kelp: "Touching the live animals, starfish (sea stars) and sea urchin."

Interviewer: "What are the threats that humans cause for sea animals?"

Blue Whale: "Yes! (thinking) The whales can eat plastic by mistake because they could be small like the animals they eat ... it can get trapped in their baleen."

Salmon: "Orcas are endangered too ... too much garbage in the ocean."

Blue whale: "There are so many plastics in the ocean, once I saw a commercial where they take plastic and make bracelets and sell it."

Interviewer: "What is your relationship with the ocean?"

Turtle: "I like to surf."

Polar Bear: "I have never been in the ocean."

Fish: "I have seen starfish [seastars] and turtles but I don't know if it was in Vancouver?"

Polar Bear: "Is the water on the beach the ocean?"

Interviewer: "If it is salty, it is!"

Polar Bear: "So I swim there!"

Interviewer: "Can you see anything in your town that has a connection to the ocean?"

Everyone thinking...

Kelp: "I think the rain is a connection. When it rains here the garbage can go to the ocean."

Turtle: "Yes, the garbage from school and homes can go to the river and get in the ocean."

Sea Lion: "I think some invasive species we have came from the ocean."

Interviewer: "How can we protect sea animals?"

Shark: "They are way too cute - we have to stop littering."

Blue whale: "We need to grab the garbage in the river so it doesn't go to the ocean and buy the bracelets!"

Shark: "Yeah, we should stop throwing garbage in the lake and recycle."

Salmon: "We should clean up the coastal areas, not throwing garbage in the river and recycling."

River: "We need to take care of them."

Turtle: "We should use reusable bags and recycle more. We need to stop buying plastic."

River: "Think about our actions before we do it."

Squid: "Recycle."

Overall, students were excited to see and touch live animals, and they showed enthusiasm for learning about local sea animals. They were able to link these experiences to previous learning, and they related animal welfare to pollution reduction actions. Most participants noted that addressing animal consumption of plastic was the most urgent action required. By experiencing being in proximity to features from the ocean, students demonstrated genuine care for the marine life that they studied in the program.

Supervising teachers also gave valuable feedback about the AquaVan program, including offering information about why they chose the program. When asked why they had participated, they shared that children did not usually get the opportunity to go to the ocean or an aquarium and that this program allowed for hands-on learning and a fun and engaging experience with aquarium staff. One noted, "I thought it would be a different and interactive activity for my students ... also, doing hands-on activities with artifacts and living things is so engaging for students."



Figure 1. The AquaVan Program

Teachers shared that the live animals were a “huge hit.” Students were surprised at the textures of the animals they touched. They appeared to have grasped key concepts from their experience. One teacher noted, “They were excited to touch the artifacts. They were excited to tell me about the furs, bones, and teeth that they saw and touched.” Lastly, when asked whether the program had met their expectations, teachers noted that it used knowledgeable, enthusiastic educators who clearly liked being around kids. One said, “It was well organized. It was engaging. The presenters had good management. Time was used wisely and effectively.”

Other constructive suggestions included that students would have benefited from more time at the live animal exhibit and that the gym set-up was distracting and loud at times. One suggestion was that since some activities were rushed, they could be spread out over two days.

Research in Action

Research in Action takes place on-site at the Vancouver Aquarium (n.d.). As the name suggests, the program engages students in research as if they were “scientists” for a day. The activity enhances observation skills, curiosity, and appreciation for local marine ecosystems. The program is rooted in a story of rockfish research and conservation in Howe Sound, B.C. The program provides a research experience where students link conservation with observation, exploration, and research. Students also examine the internal anatomy of fish through a herring dissection.

One week after the AquaVan came to the Chilliwack school, one elementary class, which included some of the same student participants from our earlier

focus groups, travel to Vancouver to attend a four-hour on-site program. The students spend a half-day informally exploring the exhibits at the aquarium before participating in the Research in Action program, which is led by the Aquarium staff. We observed student interactions and took notes on their activities. We describe the goals of the program and note how Ocean Wise leaders covered ocean topics, which they then put into a local context. We recorded information about the program through photos, document review, and informal conversation with aquarium leaders and staff.

The students arrive at the Aquarium early in the morning by school bus. The Grades 4 and 5 students are organized into two groups, each with one teacher and a parent chaperone. They explore the aquarium exhibits for about two hours. Students are very excited. For many, this is their first time at the Aquarium. The students ask many questions about the interesting animals they are seeing. The Aquarium hosts a number of exhibits that highlight not only the Salish Sea ecosystem but also tropical marine ecosystems (such as coral reefs). It also presents a simulation of the Amazon rainforest.

After their “free time,” students gather for the formal program, Research in Action. Students are directed to a classroom where the leader asks, “What did you do today that you liked the most?” Students have different responses but they all relate to the animals they saw. One student replies, “The sea otter knocking a rock into the sea urchin and then playing with a ball, I remember when we talked about it in school.” The leader then asks what the students like most about their community in Chilliwack. Responses vary but include reference to the school area, playgrounds, swimming pools, and frequently-seen wildlife (e.g., raccoons). The leader adds to their discussion by telling a story about her commute to Stanley Park, where the Aquarium is located:

We are not just people living in a place, we are sharing it. ... I need to see and listen to this place, very often I commute without realizing how my path is affecting others. ... I am not paying attention to my surroundings. I acknowledge that this place is on the unceded land of the Musqueam, Squamish, and Tsleil-Waututh Nations.

From there, the leader introduces a story about an Indigenous man who fought for a fish species to survive in spite of overfishing in his community’s traditional fishing areas nearby. To tell the story, she asks students to pretend they are this man and to find out which fish species live in Howe Sound. The program is then divided into three parts: a game, field research, and dissection.

The game. The students become excited when they hear the word “game,” and they engage with the activity. They are put into four groups for this activity. Similar to other memory games, students hold cards of two types: fishes and anatomical descriptions. In groups, students match the image of the fish with the card best describing its anatomy. They are learning about fish anatomy at the same time as they are showing what they already know. One student says, “What is the name of the fish’s [cheek] again, something with G?” Another

student in the same group answers, “They are gills.” The groups finish the game, matching all the cards. They show their work to their teacher when they are done. Transitioning to the next part, the leader says that now that they know the anatomy of each fish in Howe Sound, “It is time to dive in—please wear your wetsuits before we go to the Sound.” In this role-playing activity, students pretend to wear wetsuits while the leader says that now they cannot hear each other because they are underwater. One says, “We can talk to each other using our hands.”

Field research. In teams of two, students are given a worksheet with fish names and a catalogue, which they are asked to complete. To do so, they are released from the classroom and instructed to look for answers in the Salish Sea exhibit. As students try to locate the fishes from the worksheet, they put a check mark next to the ones they find. Working in silence, the students pretend to be exploring the ocean, learning once more about the fishes from Howe Sound. As the students continue their search, they keep pointing at the aquaria and fishes, locating most of them before the activity ends. The leader calls to them to “get back in the boat.” Finally, back in the classroom, the leader sums up the activity by saying that now that we have evidence that some fish are missing or are very hard to find: “Howe Sound should be a protected area.”



Figure 2. Ocean Wise Rockfish Exhibit (Research in Action program)

Fish dissection. Based on the level of student engagement in creating and sharing their “scientific study” with each other, it seems that dissection (a voluntary activity) is the best part of the program. Students are excited to touch and dissect a real fish from B.C. waters—a fresh-caught herring. A few students say “Ew” while others say, “They [fishes] are not gross at all!” The leader challenges them to look for something they are curious about, which can be come the basis for their scientific research. “Do not open or cut the fish without an explanation,” she says, and then provides an example: “I want to open the fish to see their brain anatomy and to see how different they are from our brain.” Each group has two fish they can dissect and investigate however they want. “Wow that is so exciting, I have never touched a fish before!!” says a student before asking, “Can I touch the fin? I want to know how it feels.”

The inquiry continues with lots of excited questioning. “Why are you making the fish bleed ... that is not good?” asks a student. Another shows us what he is doing: “I am trying to find plastic in their body or any injury.” A young girl who first says she doesn’t want to touch the fish does so anyway and says, “We have discovered the inside of their eyes. ... Wait, what is that?” Her partner replies: “The gills ... that is how they breathe!” The students are excited, and as observers we notice that the excitement increases with every new activity. To wrap up, the leader challenges the students to find one new thing in nature during their bus ride home. She states, “Every day we can observe new things and how we can take care of them.”

Teacher Professional Development

Ocean Wise also provides resources to deliver custom professional development (PD) opportunities for teachers. These involve visits to the Vancouver Aquarium for such celebrated offerings as “teacher appreciation night,” which is hosted yearly, as well as a variety of day or multi-day programming. These are augmented by a range of online resources and course modules developed around “emergent” ocean literacy themes. In this study, we followed two different programs of pre-service teachers engaged in PD, both of which were hosted by Ocean Wise. The first involved face-to-face visits to the Aquarium over several days as part of a university course; the second involved pre-service teachers only with a newly developed online education platform.

PD at the Vancouver Aquarium

In-person teacher PD at the Vancouver Aquarium involves a sampling of the various programs that are available to K–12 schools. These are adapted for an adult audience (e.g., Wet Lab or Research in Action). Teacher education programs often include “behind the scenes” tours, providing participants with a sampling of the varied conservation efforts and associated research that is

also conducted by Ocean Wise in and for local communities. The pre-service teachers that we observed appreciated the modelling of the programs, which are typically delivered to K–12 schools. They enjoyed the opportunity to try out a variety of ocean literacy strategies. Typically, a discussion followed an activity: Program staff and teachers discussed how various activities could be adapted for target age groups or specific grade levels. In the program we observed, educators were offered a range of experiences related to the Wet Lab programs. These were augmented by other programming, such as a “sustainability scavenger-hunt,” which was conducted in the marine exhibits. Program staff encouraged dialogue about on-going controversies, including one involving marine mammals in captivity.

Overall, the teacher candidates were impressed with the ocean literacy programs. An overarching theme emerging from participant comments related to a greater awareness of ocean literacy and its importance for the broader movement of environmental education. This could be described as a “bluing” of their ideas about environmental education, an area that more typically focuses on terrestrial (or green) issues. A sampling of representative comments for this theme included the following:

Student teacher (ST): “The whole planet is connected by water and oceans.”

ST: “Everything is living and they are all connected. Trees, rocks, water, kelp.”

ST: “Ocean Wise topics shed light on infinite number of systems we are connected to ...”

ST, referring to jellyfish in an exhibit: “Oh my god, when you look at the details, it’s really complex ...”

Many teachers became more aware of specific controversies at play in their community. There was a realization that controversy in and of itself is not a bad thing, and that handled professionally, considering all aspects of a controversy with K–12 students may create excellent opportunities for learning. Some representative comments for this theme were as follows:

ST: “Education is a failure when things were labelled as black or white, right or wrong.”

ST: “Not that plastic is bad. It’s our attitude ... [for example], our money is made of plastics just like (drinking) straws, but you don’t see money at the bottom of the ocean.”

Another perception was that Indigenous knowledge and pedagogy needs to be better reflected in both Ocean Wise exhibits and programming. This was acknowledged by education staff, who indicated this is emerging as a strategic initiative for Ocean Wise. Representative student comments included:

ST: “I liked the controversy part ... more indigenous aspects would be awesome.”

ST: “Ethically this is indigenous territory.”

We hoped to include some of these attempts at decolonizing education exhibits at the Aquarium and in Ocean Wise programming within our case study, but this was interrupted by complications related to COVID 19. A variety of Provincial Health and Safety orders led to the temporary closure of the Vancouver Aquarium to the public and a further suspension of the in-person aspects of their programming (including AquaVan, on-site visits, and teacher PD). As our research continued, we pragmatically shifted the focus to the online platform that was rapidly expanding in its attempts to serve the needs of teachers and K–12 students during the pandemic.

Online Platform and Educator Resources

The online platform by Ocean Wise features a newly developed Educator Resource Library—a comprehensive and curated collection of resources, lesson plans, and classroom activities designed to help educators include ocean literary curricula in their classrooms. The resource is free for teachers and is an easily navigated tool that has everything teachers need to “bring the ocean” to the classroom. In the resource library, teachers can find detailed information, activities, lesson plans, resources, and supportive media to help them incorporate ocean literacy in their classrooms. The website also breaks up the content into three main resource categories: Elementary (Grades 3–6), Middle School (Grades 7–9), and High School (Grades 10–12).

The online platform is also designed so that students can take the courses, working through the principles themselves at their own pace. For some teachers, this is a way to add a “blended learning” element to a class, or to entirely “flip the classroom.” As students interact with the courses, they earn “virtual badges” by completing quizzes and assignments. Alternatively, they can read through the material and explore the resources (including a range of curated multimedia and interactive tools). The online courses are linked to the United Nations (UN) Sustainable Development Goals, and they also align with principles outlined in the UN Decade of Ocean Science for Sustainable Development.

As part of our study, we asked a cohort of teachers and teacher-candidates (enrolled in a university course) to interact exclusively with the education courses and resources available to them on the online platform. Participants were assigned to user groups that were linked to their classroom and grade level experience. They were then asked to provide feedback to the Ocean Wise staff and course designers. Feedback ranged from comments on the “usability” features of the website to the quality and age appropriateness of content and resources made available for the courses at each of their intended grade levels (Table 1).

Positive	Constructive
Great video resources Included story maps are awesome Teacher resources are good Love the lesson plans The curriculum achievements are helpful – they link to specific activities that match the ‘big idea’	Reading level is too high and complicated Too much text not enough visuals Need easier connection to the curriculum components – include in descriptions of each resource so they don’t have to read through Include more interactive resources Include more French resources

Note. Middle School Level (Grades 7–9, ages 12–14): See <https://education.ocean.org/oceanlitmid/>

Table 1. *Summary of Feedback from Teacher-Candidates*

Overall, feedback from participating teachers was positive with regard to the utility of the online platform provided. Educators were thankful for the provision of a comprehensive and content rich resource, especially as it had been provided free of charge to educators since the beginning of the pandemic. The widespread use of this ambitious and developing resource has assisted many educators through a challenging time for the K–12 education system.

As with any new platform, educators had much to say about how the online resource could be improved over time. Many felt the platform should make its “curriculum achievements” clearer for each resource or assignment, arguing that students are more likely to use the platform if it is easy to find and access these achievements. Teachers also argued the resource could be improved with more visuals and more interactive components. Some recommended shorter courses in order to reduce the amount of student time spent at the computer.

Participating teachers also noted that the usability of the online platform would be improved if it were there were two designs: one for students and one for teachers. They further recommended that the provision of briefing and debriefing information for the entire course would improve the overall quality of the online platform and its associated educational resources.

Discussion

This case study provides only a brief snapshot of the range of Ocean Wise’s ocean literacy programming. Although the concept of ocean literacy has been explored by Ocean Wise for several years, our study provides a first glimpse into how the programs have been designed and the perceptions that participants have as they interact with them. Importantly, this research set out to understand students’ and teachers’ unique experiences with programming using a mixed methods approach with the intent to inform future program design. We return now to our guiding research questions in order to structure the discussion of our case study results.

How Are the Programs Generally Perceived by Students and/or Teachers?

It is important to note that Ocean Wise has developed a positive reputation in the education field and is widely regarded as a leader in ocean literacy programming. The perceptions of both students and teachers were very positive, especially with regard to those parts of the programs that incorporated aspects of experiential education. For example, the observed excitement level of students during and after the activities are broadly highlighted in our results.

Students felt that the AquaVan program provided some unique opportunities to touch and observe animals up close in a familiar environment. The program was perceived positively across age groups, though feedback between the different ages varied. While younger students perceived the activity to be “very long,” older students claimed the opposite. This suggests that the length of the program should be adjusted relative to the age group involved as it did not appear from the feedback that the same format works well for all grade levels. Younger children also suggested that because the program is run in the gym it should incorporate more games. Some students considered the opportunity to feel, see, and act like marine mammals to have been rushed and intense. When we asked older students about how to improve the program the following comment was typical: “AquaVan should give us more time to see the animals and the stations, it is all way too fast.” This comment indicates that a few changes in the design could be made, including its intensity. Despite some constructive criticism, students indicated they would participate in the program again and would recommend it to friends and family. All students told us they had an exciting first-time experience seeing and touching live animals and that they hoped to see more animals in nature. This type of positive experience is important especially for children as it has been shown to influence intellectual, social, and emotional development as well as fostering positive attitudes toward the environment (Gill, 2014; Joyce, 2019).

Other positive perceptions were witnessed in our interactions with the Aquarium-based Research in Action program. During a visit to the Aquarium, we observed students’ interest in and excitement about activities escalating from moderate to high. The way the activity was led was important for the engagement of everyone involved, with the leader providing time and freedom for students to explore and engage in ways that developed their inquiry skills. All students were active in finding a rationale for dissecting the herring and even those initially hesitant were actively engaged by the end. Similar observations were made within the Teacher Education programs, with participants excited to touch live invertebrates in the touch pools of the WetLab or to “muck about” in hip-waders in the inter-tidal zone during a beach cleanup activity.

Do the Program's Activities Inspire or Motivate Students to Become Ocean Literate?

Through the range of programming observed, it was clear that the type of activities designed work to inspire and motivate students to become ocean literate across programs and grade levels. With its inquiry-based approach, Ocean Wise leaders encourage students to ask their own questions. Our results indicate that the activities provided by AquaVan (for example) created a closer intimacy with and understanding of the marine lives that rely on the ocean. The variety of ocean specimens (e.g., seawater with krill, curated preserved specimens, live invertebrates) attracted the attention of both students and teachers.

Since our study school was not located near the sea, most students were seeing these ocean creatures for the first time. One pupil was not sure if she had swam in the ocean before, realizing only for certain that she hadn't when she realized that the ocean has salty water. By studying ocean literacy in such a removed context, where people possess varying levels of knowledge about the ocean, we realized the goal of ocean literacy may have a long way to go. Further, many activities are designed with open-ended space for students who have had rich experiences with the ocean to recall moments near the sea (eg. interacting with marine life or in quiet contemplation simply watching the sunset from shore). Although the program included narratives and facts about the ocean, students were also welcomed and encouraged to share their thoughts.

Importantly, Ocean Wise leaders also emphasized the concept of ocean pollution and encouraged students to relate their experiences in the sea to plastic pollution. As observers, we also noted that Ocean Wise program goals and practices are closely aligned with the drive among environmental educators to highlight the importance of understanding ocean complexity in order to foster student "connection" with nature and help them comprehend the cruciality of nature conservation.

Our conversations with students revealed that they cared about and empathized with the animals they met or those about whom they heard stories. By speaking about their past actions (e.g., collecting waste on the beach), and by stating that we need to reduce, reuse, and recycle more, students demonstrated their concern for the environment. For example, when they were asked to touch a sea urchin with their little finger so they would not hurt the animal, students were provided with an opportunity to empathize. Reinforcing these feelings can also increase students' understanding of animals' behaviour and needs, as well as improve their awareness of how animals might respond to stimuli. These practices can nurture students' sense of care and actions to benefit all wildlife (Bandura, 2000; Chawla, 2009; Wharton et al., 2019).

Students also demonstrated an understanding of the ocean's influence on human needs, such as its provision of food and medicine. They also exhibited an appreciation for marine organisms in the food chain and the benefits

humans receive from the sea. The impact of plastic pollution on marine species is an example of human influence on the ocean. By sharing a turtle shell from the B.C. coast, leaders showed how the Leatherback Turtle is a visitor to the local sea. They warned students that a single plastic bag in the ocean can be mistaken for a jellyfish, which is a turtle's main source of food. Activities such as these fostered understanding about the impacts the ocean has on us, and vice versa. Most notably, one of the students in a focus group stated that the only negative aspect of the program was her realization that many animals are dying from pollution. As stated by Wharton et al. (2019), "Empathy is a stimulated emotional state that relies on the ability to perceive, understand and care about the experiences or perspectives of another person or animal" (p. 158). They add that these feelings are primordial.

Implications

In our case study, we hoped to better understand how Ocean Wise programming increased students' connection to local (aquatic or coastal) environments. Research in Action was a good example of a program that intended to make such connections. The program we observed explored the Howe Sound marine ecosystem through a dynamic and interconnected group of activities organized around narratives in which students were the main agents. Using storytelling and hands-on activities, the program inspires students to become ocean literate.

In our view, Research in Action plays a critical part in a localized (place-based) ocean literacy program. As described above, in this program, children spend one day playing, watching, and doing activities related to the nearby Salish Sea during an in-person visit to the Aquarium. Students showed enthusiasm throughout the day as they played the role of researchers investigating the local marine environment. When students play interactive roles in a learning environment that is closely connected to place, they understand and connect to the world being showed to them in a meaningful way (Payne & Zimmerman, 2010).

As also described above, students participating in this program used their imagination and engaged in hands-on activities to explore and find answers to their own questions. When looking for local species of fish, students were quiet but very keen to identify specific local species. By providing locally-referenced experiences, the program allowed students to go beyond curriculum expectations and scripts, planting a seed of inquiry that perhaps can become a scientific journey or a more personal adventure. Students were deeply engaged when the leader indicated students could look for anything they wanted in the third part of the activity (herring dissection) as long as there was a "scientific" reason. Experiential moments such as these can inspire students to "think outside the box" and appreciate their important role in revealing the mysteries of the ocean.

For a broader, individual interpretation of Ocean Wise programming, teacher education programs that we observed also allowed participants to use critical thinking and inquiry skills in developing their own personal conceptions of ocean literacy. All PD efforts highlighted human activities as the major influence on species extinction. Through localized narratives from Howe Sound and other examples, the programs offered an opportunity for teachers and students to embrace practices that foster critical inquiry skills and to understand the consequences of these skills for place-based educational practice.

In contrast to Research in Action, the AquaVan program did not include specific connections to local community. While children were encouraged to share their experiences with the ocean, leaders did not integrate other possible local and community connections. Since the program was offered inland (on the Fraser River), the program might have included numerous examples of how river systems, estuaries, and eelgrass meadows connect them to the Salish Sea. Indeed, many important physical, social and cultural aspects of the local community were not explored. Including a broader community context could work to improve or broaden students' local interpretations of ocean literacy.

Some Challenges

As a final theme for our inquiry, we hoped to uncover some of the key lessons and challenges faced in delivering ocean education programming. It is clear that the core strength of Ocean Wise programs is in how they connect students to the ocean through direct and hands-on experiences with marine organisms. In doing so, children can personalize their understanding. From there, students can ingest what it means to conserve and protect marine fauna and flora. Curated and live specimens can work to bridge students empathy and knowledge of the lives of ocean animals. Many students in our study had never previously experienced living sea creatures. In these cases, without tangible experiences, the ocean becomes a distant reality. Environmental awareness seems to be a key result of Ocean Wise programming; however, there remain some key challenges to overcome.

By enhancing marine education and awareness, Ocean Wise can inspire the next generation to have a greater understanding of and appreciation for the ocean. Still, it cannot effectively do so without a stronger focus on place-based and community engaged forms of learning. Bringing a renewed focus to local contexts would help students to make more connections to their daily lives. A simple solution for AquaVan might be for leaders to dialogue more with school staff prior the delivery of a program or to make further information about specific local impacts available for students to take home. Another challenge we can take from the Ocean Wise approach is that connecting students with the ocean goes beyond textbooks and stand-up delivery approach. As we witnessed, connecting students to the ocean requires action, empathy, and

experiential moments. Attempting to develop or adapt Ocean Wise programming to an online environment creates unique challenges as it is difficult to replicate these types of experiences in the digital environment. Teachers who reviewed the online platform noted confusion about the website's architecture. As stated above, most felt there should be distinct ways for teachers and students to view and interact with the course materials. Moving forward, it is advisable to narrow the scope of online courses and to clarify how they can be student- or teacher-led. A constructive suggestion was that the platform could be separated into two courses: a teacher guidebook on ocean literacy in the classroom and a separate course for home learners and/or distance education students.

Finally, there remains the challenge of including more Indigenous content into all forms of Ocean Wise programming, whether delivered on-site, through mobile programming, or via the online platform. This view was also recognized by the senior Ocean Wise leadership team itself:

Nine months ago, we started a co-operation with the local Squamish communities ... we have very limited knowledge from indigenous perspectives in our exhibits. Yet there is large opportunity for more integrated Indigenous knowledge. ... We need to set tangible targets and hold ourselves accountable. (Administrator)

It is important to note here that the goal to include more Indigenous knowledge in educational programming (and curriculum) is a priority for many organizations at this time and is a challenge faced by the K-12 education system across Canada. Universities and teacher education institutions too play a key role in efforts to decolonize our educational practices and to include more Indigenous knowledge and pedagogy in the education of K-12 students and their teachers.

Conclusions

The ocean we rely on is beautiful, important, and inspiring. It faces clear threats that we must mitigate. It is evident from our research that Ocean Wise is a key player in the field of ocean literacy. It employs a multipronged approach involving engagement, research, conservation, and education to promote these concepts in B.C. and across Canada. While relationships among factors such as conservation, education, and behaviour change are complex, we believe that by increasing ocean literacy delivery across Canada, Ocean Wise programming positively impacts students and communities with regard to their environmental awareness by increasing their knowledge about ocean-related issues.

The breadth and depth of ocean literacy programming for teachers and students that Ocean Wise provides is impressive. While our study describes only a handful of Ocean Wise programming our case study gives rich examples of the many currents of ocean literacy that are flowing in B.C. These provide

opportunities for participants to nurture and improve their connection with, understanding of, and appreciation for the ocean. By keeping a local focus on explorations of the Salish Sea, Ocean Wise also plays an important role in educating individuals to better understand the impact of the ocean on their lives and their own influence on ocean environments. As Scully (2018) noted,

If the intention is to influence behavioural change and build a sense of co-management, then it is essential to ensure that people understand the issue as it relates to them, feel responsibility for it, and feel motivated to take action, and [...] be capable of doing so. (p. 43)

As with any endeavour, there will still be challenges and limitations that can be addressed in efforts to create a better experience for students, teachers, and the general delivery of ocean literacy across Canada. We believe that future research will be essential in promoting these efforts. One idea for future research is to promote a more ecological view of programming—one that focuses on the *relationships* among the different programs on offer rather than on just the programs themselves. It was also interesting to note that even in this case study, a number of participants experienced several different types of programming offered by Ocean Wise and/or other organizations. It would be interesting to explore how different programs reinforce or impede the intended program outcomes. Finally, increased partnerships with schools and communities are encouraged in order to foster more local and long-lasting experiences that could result in stronger outcomes (or actions) with respect to maintaining a healthy marine environment for all to enjoy.

References

- Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current Directions in Psychological Science*, 9(3).
- Blenkin, G. M., & Kelly, A. V. (1994). *The national curriculum and early learning: An evaluation*. Paul Chapman Publisher.
- British Columbia Ministry of Education. (2007). *Environmental learning and experience: An interdisciplinary guide for teachers*. https://www2.gov.bc.ca/assets/gov/education/kindergarten-to-grade-12/teach/teaching-tools/environmental-learning/enviro_learning_exper.pdf
- Bruce, T. (2004). *Developing learning in early childhood*. Edward Elgar.
- Bogner, F.X. (1998). The influence of short-term outdoor ecology education on long-term variables of environmental perspective. *The Journal of Environmental Education*, 29(4), 17–29.
- Canadian Ocean Literacy Coalition. (2019). *Canada's ocean literacy strategy*. Retrieved November 20, 2019, from <https://colcoalition.ca/canada-ocean-literacy-strategy/>.
- Chawla, L. (2009). Growing up green: Becoming agents of care for the natural world. *Journal of Developmental Practices*, 4(1).

- Fauville, G. (2019). Ocean literacy in the twenty-first century: Exemplary practices in marine science education. In G. Fauville, D. L. Payne, M. E. Marrero, A. Lantz-Andersson, & F. Crouch (Eds.), *Exemplary practices in marine science education: A resource for practitioners and researchers* (pp. 3-11). Springer. https://doi.org/10.1007/978-3-319-90778-9_1
- Fortner R. W. (2019). An exemplar model for expanding development reach. In G. Fauville et al. (eds.), *Exemplary practices in marine science education*, https://doi.org/10.1007/978-3-319-90778-9_2
- Gruenwald, D. A. (2003). The best of both worlds: A critical pedagogy of place. *Educational Researcher*, 32(4), 3–12. <https://doi.org/10.3102/0013189X032004003>
- Guest, H., Lotze, H. K., & Wallace, D. (2015). Youth and the sea: Ocean literacy in Nova Scotia, Canada. *Marine Policy*, 58, 98-107. <http://dx.doi.org/10.1016/j.marpol.2015.04.007>
- Gill T. (2014). *The benefits of children's engagement with nature: A systematic literature review*. Children, Youth and Environments.
- International Union for Conservation of Nature (IUCN). (n.d). *Marine and polar: Climate change and the ocean*. Retrieved February 15, 2021 from <https://www.iucn.org/theme/marine-and-polar/our-work/climate-change-and-ocean>
- Joyce, J. (2013). *How to create marine outreach programmes that work*. In Proceedings of the European Marine Science Ed Association Annual Conference, Plymouth, UK.
- Joyce, J. Dromgool-Regan C., & Burke N. (2019). *Creating marine outreach programmes that work*. The Marine Institute Explorers Education Programme. In G. Fauville et al.(eds.) *Exemplary Practices in Marine Science Education*, https://doi.org/10.1007/978-3-319-90778-9_2
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, N.J.
- Kostoulas, A. (2010). *Between paradigms: A research proposal for a case study in a language school in Greece*. Manchester 1824, The University of Manchester.
- Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approaches*. Guilford Press.
- McPherson, K., Wright, T., & Tyedmers, P. (2018). Challenges and prospects to the integration of ocean education into high school science courses in Nova Scotia. *Applied Environmental Education & Communication*, 19(2), 129-140. <https://doi.org/10.1080/1533015X.2018.1533439>
- Mogias, A., Boubonari, T., Realdon, G., Previati, M., Mokos, M., Koulouri, P., & Cheimonopoulou, M. T. (2019). Evaluating ocean literacy of elementary school students: Preliminary results of a cross-cultural study in the Mediterranean. *Frontiers in Marine Sciences*. <https://www.frontiersin.org/articles/10.3389/fmars.2019.00396/full>
- Myers, O. E., Jr., & Saunders, C. D. (2002). Animals as a link toward developing caring relationships with the natural world. In P. H. Kahn, S. R. Kellert, et al. (Eds.), *Children and nature: Psychological sociocultural and evolutionary investigations* (pp. 153-178). MIT Press.
- National Oceanic and Atmospheric Administration. (2013, March). *Ocean Literacy: The essential principles and fundamental concepts of Ocean Sciences for learners of all ages* (version 2). www.oceanliteracy.net
- Ocean Wise. (2018). *Ocean literacy: What is ocean literacy*. <https://literacy.ocean.org/>
- Orr, D. W. (1992). *Ecological literacy: Education and the transition to a postmodern world*. State University of New York Press.

- Orr, D. (1994). *Earth in mind: On education, environment, and the human prospect*. Island Press.
- Payne, D. L., & Zimmerman, T. D. (2010). Beyond *terra firma*: Bringing ocean and aquatic sciences to environmental and science teacher education. In A. Bodzin, B. Shiner Klein, & S. Weaver (Eds.), *The inclusion of environmental education in science teacher education* (pp. 81-94). Springer.
- Santoro, F., Santin, S., Scowcroft, G., Fauville, G., & Tuddenham, P. (2017). *Ocean literacy for all: A toolkit*. IOC/UNESCO & UNESCO Venice Office (IOC Manuals and Guides, 80), Paris. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000260721>
- Scully, S. (2018). *Ocean literacy in Canada: Literature review*. Canadian Ocean Literacy Coalition. <https://colcoalition.ca/wp-content/uploads/2020/02/literature-review-web.pdf>
- Seamon, D. (1984). Emotional experience of the environment. *American Behavioural Scientist*, 27(6), 757-770.
- Sobel, D. (1993). *Children's special places: Exploring the role of forts, dens, and bush houses in middle childhood*. Zephyr Press.
- Sobel, D. (1996). *Beyond ecophobia: Reclaiming the heart in nature education*. Orion Society.
- Stake, R. E. (1995). *The art of case study research*. Sage.
- Thomashow, M. (1996). *Ecological identity: Becoming a reflective environmentalist*. MIT Press.
- Vancouver Aquarium. (n.d.) *Research in action*. Retrieved February 15, 2021 from <https://www.vanaqua.org/education/school-programs/research-action>
- Woodhouse, J. L., & Knapp, C. E. (2000). *Place-based curriculum and instruction: Outdoor and environmental education approaches*. *ERIC Digest* (ERIC Document Reproduction Service No. EDO-RC-00-6).
- Waddington, S. (2017, April 21). Chilliwack – A Coastal Rainforest. *Chilliwack, British Columbia*. <https://tourismchilliwack.com/chilliwack-a-coastal-rainforest/>
- Wharton, J., Khali, K., Fyfe, C., & Young, A. (2019). Effective practices for fostering empathy towards marine life. In G. Fauville, D. L. Payne, M. E. Marrero, A. Lantz-Andersson, & F. Crouch (Eds.), *Exemplary practices in marine science education: A resource for practitioners and researchers* (pp. 157-168). Springer. https://doi.org/10.1007/978-3-319-90778-9_10
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE.

Including the Ocean in Formal K–12 Climate Education: Assessment of a Lesson for Middle and High School Students

Jennifer Putland, Maia Hoeberechts, Monika Pelz, Lauren Hudson, Cody Tolmie & Mauricio Carrasquilla-Henao, Learning & Community Engagement, Ocean Networks Canada

Abstract

Formal climate education without consideration of the ocean is incomplete. The effectiveness of a new climate lesson for youth that includes the ocean–climate nexus was examined by delivering the lesson to nine classes situated in separate British Columbia, Canada public schools and assessing the students’ understanding of basic climate concepts before and after the lesson. Among the youth assessed, before-lesson understanding of basic climate science concepts was low. The lesson led to significant improvements in the understanding of climate science; the after-lesson level of understanding appears to be a function of age. The classes with the lowest (29%) and highest (73–79%) after-lesson class averages were the classes composed of the youngest and oldest students, respectively. The age-related differences are considered with respect to the students’ cognitive developmental stage, and suggestions are made to improve understanding among younger students.

Résumé

Les cours portant sur le climat qui sont donnés dans le cadre du programme scolaire sont incomplets s’ils n’intègrent pas les enjeux océaniques. Le présent article examine donc l’efficacité de la nouvelle éducation au climat qui tient compte de la dynamique climat-océan. Le nouveau modèle éducatif a été présenté dans neuf classes de différentes écoles publiques de la Colombie-Britannique (Canada). Avant et après la leçon sur le climat, la compréhension qu’avaient les élèves des concepts climatiques de base a été mesurée. Avant la leçon, le niveau de compréhension des élèves était faible, mais s’améliorait beaucoup après la leçon, en fonction de l’âge des élèves. Les moyennes les plus faibles (29 %) étaient chez les plus jeunes, les élèves plus vieux ayant obtenu les résultats les plus élevés (73-79 %). Les écarts dus à l’âge sont analysés en tenant compte du stade de développement cognitif des enfants et des suggestions sont faites pour améliorer la compréhension des plus jeunes élèves.

Keywords: climate change education, assessment, cognitive development stage, authentic data, hands-on activities, storytelling

Mots-clés : éducation relative aux changements climatiques, évaluation, stade de développement cognitif, données authentiques, activités pratiques, apprentissage par le récit

Introduction

A special report by the Intergovernmental Panel on Climate Change (IPCC), the United Nations body for assessing the science related to climate change, asserts that global warming of 2°C above pre-industrial temperatures will lead to greater impacts than if global warming is restricted to 1.5°C above pre-industrial temperatures (IPCC, 2018). To restrict warming to a maximum of 1.5°C above pre-industrial temperatures will require global net anthropogenic CO₂ emissions to decline by about 45% from 2010 levels by 2030, reaching net zero around 2050 (IPCC, 2018). To achieve these emission reductions will require “rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings), and industrial systems” (IPCC, 2018, p.15). The IPCC fifth assessment report also indicates that adequate mitigation, that is, actions intended to reduce anthropogenic emissions of greenhouse gases (GHGs), poses “substantial technological, economic, social and institutional challenges, which increase with delays in additional mitigation” (IPCC, 2014, p. 20). Furthermore, the IPCC (2014) states that “delaying additional mitigation increases mitigation costs in the medium to long term” (p. 24). Moreover, if there are considerable delays in additional mitigation, then constraining warming to 2°C over pre-industrial temperatures will not be possible over the 21st century (IPCC, 2014). Ambitious mitigation plans not only require citizen endorsement so that governments have the political space to make the required changes (Lee et al., 2015; Watkins, 2007), but also require citizens in industrialized nations to actively reduce their personal GHG emissions (Anderson, 2010). Indeed, as indicated in Canada’s mid-century long-term low-greenhouse gas development strategy (Environment and Climate Change Canada, 2016), reducing GHG emissions will require “substantial effort on the part of all Canadians” (p. 3).

Improving knowledge of climate change through formal education is an important step toward acquiring citizen endorsement of government mitigation programs and reducing individual GHG emissions (Anderson, 2010; Brownlee et al., 2013; Busch et al., 2019; Lee et al., 2015; Shi et al., 2016; Trott, 2019). There is ample evidence that students, teachers, and the public do not have adequate knowledge of the basic science of climate change (Bofferding & Kloser, 2015; Duffy et al., 2019; Hestness et al., 2014). If citizens are to reduce their personal GHG emissions, they need to understand foundational concepts of climate change and its complex causality chains (Lehnert et al., 2019) to make effective choices that impact the climate system (Bofferding & Kloser, 2015; Karpudewan et al., 2015). Indeed, due to the complex interplay between factors such as ideology, social norms, efficacy, hope, concern, and certainty, knowledge alone may not be sufficient to significantly improve personal mitigation (Busch et al., 2019; Hoffman, 2011; Tolppanen et al., 2020). It can, however, enable informed decisions (Anderson, 2010; Bofferding & Kloser, 2015; Busch et al., 2019; Tolppanen et al., 2020).

Formal climate change education is also important as it can offset the negative influence of ideology and worldview on climate change opinion (Busch et al., 2019; Guy et al., 2014). Without formal climate change education, misinformation and misconceptions can fill the void, leaving citizens misinformed and prone to biased assimilation or confirmation bias (Brownlee et al., 2013; Fortner, 2001; Hestness et al., 2014; McBean & Hengeveld, 2000). Finally, there is a moral imperative to educate youth on climate change. This education may facilitate societal transformation as youth can be effective knowledge bearers and powerful agents of change (Anderson, 2010; Bond et al., 2021; Lawson et al., 2018; Trott, 2019; Trott & Weinberg, 2020).

Formal Climate Change Education in Canada

Formal climate change education within K–12 curricula exists in Canada, but it does not consistently reflect either current scientific understanding or jurisdictional (province and territory) climate policies. While all jurisdictional climate policies focus on the need for education to contribute to addressing climate change, there is a comparative lack of attention given to climate change in education policy across jurisdictions (Bieler et al., 2018). This deficiency in formal climate change education may be attributed to a lack of coordination between climate and education policymakers (Bieler et al., 2018). Another possible reason for this shortcoming may be that jurisdictional K–12 curricula are guided by the Pan Canadian Science Curriculum (PCSC), in which inclusion of climate change education is very limited (Council of Ministers of Education Canada [CMEC], 1997). In 2009, UNESCO issued a supplementary policy statement stressing climate change education must be included in all education systems “if the necessary changes in society are to be effected in time” and subsuming climate change education under education for sustainable development (Nazir et al., 2011, p. 365). In Canada, climate change education occurs within environment and sustainable development courses (Bieler et al., 2018)—courses that are typically electives. There is variability in mandatory climate change education across jurisdictions (Bieler et al., 2018; Wynes & Nicholas, 2019), and erroneous information exists in some curriculum documents and textbooks (Wynes & Nicholas, 2019).

A recent national survey was conducted to understand levels of knowledge and perceptions of climate change among public, parents, youth, and educators in Canada (Field et al., 2019). The survey found that formal educators are the primary source of climate change education for youth; among those teaching climate change education, each dedicates only 1–10 hours to climate change education per year. A significant portion of the educators do not have a solid understanding of climate change and acknowledge they do not feel prepared to teach the subject. Thus, it is not surprising that 43% of Canadians (general public) surveyed failed a climate change knowledge test. Nevertheless, most

Canadians (general public) are concerned about climate change, support more climate change education for Canadian youth, and believe that climate change education should be an educational priority.

Inclusion of the Ocean–Climate Nexus

Within the PCSC there is no mention of the ocean–climate nexus; yet, without consideration of the ocean, climate change education is incomplete. By absorbing a significant portion of carbon dioxide emissions (39%, depending on atmospheric carbon dioxide concentrations) (McKinley et al., 2020) and 90% of heat generated from GHG emissions (IPCC, 2007), the ocean buffers the Earth from extreme heating. The ocean also provides a host of ecosystem services (e.g., water, oxygen, food, medicines, minerals) that support the health and socio-economic well-being of society (Lemmen et al., 2016; Glithero, 2020) and are a critical source of food, culture, and spiritual support to Inuit and First Nations (Lemmen et al., 2016). If it were a country, the annual gross marine product places the ocean as the world’s seventh largest economy, with at least two-thirds relying on a healthy ocean (Hoegh-Guldberg, 2015). Despite its vastness, the ocean is being degraded by multiple stressors, and human-caused climate change is a dominant stressor (United Nations [UN], 2017). Climate change is impacting the ability of the ocean to provide the services/conditions that humans and other life require (UN, 2017).

Opportunities, however, do exist for the ocean to contribute to achieving temperature stabilization goals (Hoegh-Gulderg et al., 2019), which also represent future career opportunities for Canadian youth. In Canada, British Columbia (B.C.) is considered a leader in climate policy (Bieler et al., 2018) and is also significantly dependent on its adjacent marine environment. Yet, within the B.C. K–12 curriculum, the ocean environment is only a significant component of climate change education for Earth Science 11, Environmental Science 12, and Physical Geography 12, and is not included in the mandatory courses containing climate change education (Science 7 and 9, Social Studies 10). Not surprisingly, a recent survey found that only ~10% of Canadians surveyed consider ocean warming and climate change to be a significant threat to the ocean (Glithero, 2020). The ocean–climate nexus is a fundamental component of climate change science, and its inclusion in formal climate change education would contribute to Canada’s ocean literacy (an understanding of ocean’s influence on us, and our influence on the ocean) initiatives within the United Nations (UN) Decade of Ocean Science for Sustainable Development (2021–2030). Indeed, many aspects of Canadian ocean literacy (e.g., importance of science, economics, communication, informed decisions, behavioural change, interdisciplinary learning, inclusion of Indigenous perspectives and knowledge, social justice) (Stewart, 2019) overlap with climate literacy.

Teaching climate change can be challenging for teachers. There can be a reluctance to teach that which is deemed controversial among peers/parents/

administrators (Field et al., 2019; Hestness et al., 2014; Monroe et al., 2019). Teachers also feel they lack the time and skills to adequately deliver climate change education instruction, address controversies (Hestness et al., 2014; Lehnert et al., 2019; Monroe et al., 2019; Tolppanen et al., 2020), and regulate and/or respond to student emotions resulting from climate change education (Ojala, 2016). Most Canadian teachers indicate that they require resources (e.g., lesson plans) and more professional development to teach climate change education (Field et al., 2019). Including the ocean–climate nexus within formal climate change education can be challenging for many teachers because, unfortunately, many Canadian teachers do not have the capacity (e.g., time, resources, educational background) to incorporate ocean education into their mandated curriculum (McPherson et al., 2020).

An Ocean–Climate Science Lesson

Given the role that education can play in improving climate change mitigation, the importance of educating youth specifically, the lack of understanding among Canadians regarding the ocean–climate nexus, and the need among teachers for a climate change education resource that includes the ocean, the Learning & Community Engagement department at Ocean Networks Canada (of whom the authors are a part)¹ created a climate science lesson for middle school (MS, Grades 6–8) and high school (HS, Grades 9–12) students (www.oceannetworks.ca). This lesson is freely available (contact: learning@oceannetworks.ca) and examines causes of climate change and impacts of climate change on the ocean with hands-on activities, authentic data from Ocean Networks Canada (ONC) observatories, and Inuit Traditional Ecological Knowledge (TEK). As well, the lesson encourages students to think of and act on solutions to climate change. We used hands-on activities to mean, “students are actively engaged in manipulating materials,” to facilitate the development of knowledge, skills, and attitudes - major dimensions of learning in science (Flick, 1993, p. 2), and an interest in the subject (Holstermann et al. 2010). We used data in various forms (video, camera, acoustic, and scalar) to engage students, teach ocean concepts, and to facilitate the development of analytical and problem-solving skills (Greengrove et al., 2020). By Inuit TEK, we refer to knowledge of climate change that Inuit have established over millennia through their ongoing observations and close relationship with the natural environment for survival, sustenance, travel, and cultural practice.

The lesson addresses the need for improved education on climate science, a target objective of the United Nation Sustainable Development Goal (SDG) 13 “Climate Action,” which includes the following specific objectives: improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning (UN, 2015). The lesson also addresses SDG 14 “Life Below Water,” which outlines the following

specific objectives: the learner knows the basic premise of climate change and the role of the oceans in moderating our climate; the impact humanity is having on the oceans (UN, 2015). Our objective was to create a lesson that improves understanding of basic climate and ocean–climate facts. We repeated the lesson with nine classes (four middle school and five high school) situated in separate B.C. public schools and, with a simple written quiz, we evaluated student understanding immediately before and after the lesson.

Instructional Method

While there are many effective instructional models, for our lesson we chose the 7E instructional model, an adaptation of the 5E instructional model wherein students build understanding through a 5-stage learning sequence (Engage, Explore, Explain, Elaborate, and Evaluate). Developed in the 1980s, the 5E instructional model is grounded in constructivist theory and is widely used because of its effectiveness in improving student understanding (Bybee et al., 2006; Karpudewan et al., 2015). The B.C. curriculum requires that teachers incorporate Indigenous perspectives and knowledge where possible, and this knowledge creates a more holistic understanding of complex concepts. The First Nations Education Steering Committee, a policy and advocacy organization representing First Nations in B.C., proposed the 7E instructional model wherein *Elder* and *Environment* are added to the 5E model so as to facilitate the incorporation of Indigenous knowledge (Bernabei et al., 2019). The following subsections outline our specific pedagogical approach within the 7E instructional model (Engage, Explore, Explain, Elaborate, Elder and Environment, Evaluate), and includes an additional section entitled “Lesson Conclusion.”

Engage

Stories and entertainment are effective means through which to engage learners and build their trust (Brownlee et al., 2013; Flora, et al., 2014). Thus, as part of our introduction to Ocean Networks Canada, we used the freely available data from Oceans 2.0 (ONC’s data management system at <https://data.oceannetworks.ca>) in an entertaining personal story format to pique student interest in the ocean and convey the message that scientific data are integral to making informed decisions with respect to ocean management, disaster mitigation, and environmental protection. For example, in one instance, we shared a humorous personal story of a hagfish and then played an excerpt of a video (<https://youtu.be/nzMB8jqioV0?t=78>), which we muted, to engage the students in the initial stages of the scientific process: What do you think is going on here? Who are these animals? What happened and how could that have happened? What depth is this, and what might be the scientific implications of this discovery? We also played the full video (<https://youtu.be/nzMB8jqioV0>) to emphasize that scientists

don't know everything and new discoveries are continually being made not only by scientists but also by citizens and students.

Explore

Effective educational strategies allow for an exploration of how the lesson topic is of personal relevance to students (Hestness et al., 2014; Monroe et al., 2019). Thus, as an introduction to the *Explore* phase, students had the opportunity to discuss their understanding of climate change and its relevance to them. This was done as a class, but it could also be done in smaller student groups. This was followed by a short (~ 10 minute) teacher-led presentation on climate change and warming in the ocean. The students were prompted with the question, “How does warming impact the ocean?” Educational programs that have engaging hands-on activities, are learner-centred (i.e., learners create their own understanding), collaborative, and follow the scientific process lead to improved learning (Holstermann et al., 2010; Lehnert et al., 2019; Monroe et al., 2019). Thus, to explore answers to the driving question, “How does warming impact the ocean?”, students gathered into small groups and visited three activity stations, rotating between stations every 15–20 minutes. At each station, students were provided with a background summary on a scientific concept (gas solubility, ocean acidification, and Arctic sea ice). They worked together to formulate a hypothesis that the activity addressed and conduct the activity by following procedures. At the conclusion of the activity, students were asked if the results supported their hypothesis. If the results did not, then they had an opportunity to revise their hypothesis. They then tested their hypotheses, with authentic ocean data, in the Elaborate phase of the lesson. Given time constraints, at each station there was one teacher or facilitator available to help students. For logistical reasons, the ocean acidification activity was done at the same time as the activities related to impacts from warming. This was explained at the start of the hands-on activities.

Explain

Allowing students the time to explain their learning can give them a better understanding of climate science, particularly if there are deliberate discussions that challenge them to explain their understanding (Monroe et al., 2019). Thus, the class convened after the station-based activities, at which time the teacher prompted students to explain their observations. Below is an example of a discussion regarding the gas solubility activity,

Teacher: What happened to gas solubility when the water temperature increased?

Students: Silence.

Teacher: What was within the bubbles?

Students: Carbon dioxide.

Teacher: What happened to the bubbles in the pop as temperature increased?

Students: Bubbling increased (at first).

Teacher: Where did those bubbles of carbon dioxide go?

Students: Burst at surface.

Teacher: Where did the carbon dioxide go then?

Students: Air.

Teacher: So, does warm water hold more or less carbon dioxide?

Students: Less.

Following this discussion portion of the lesson, students learned that although this activity focused on carbon dioxide gas, other gases (e.g., oxygen) behave similarly. In other words, as water temperature increases, it holds less oxygen gas. This type of discussion occurred for each of the activities. After this discussion, the students received a short (~ 15 minute) teacher-led presentation that gave teachers the opportunity to augment student explanations. Where appropriate, figures of authentic data were included in the presentation (e.g., sea ice data from the Arctic, atmospheric carbon dioxide concentrations, pH of seawater with respect to time). We used authentic data for several reasons. First, students gain experience (with some scaffolding) in describing, analyzing, and interpreting data—important skills for facilitating their independent interpretation of data (Greengrove et al., 2020). Second, interpreting data improves understanding of concepts (Greengrove et al., 2020; Monroe et al., 2019), which helps students to communicate more confidently and competently on the topic of climate science (Gold et al., 2015; Sloane & Wiles, 2020) and counter skeptical claims (Monroe et al., 2019). Third, research indicates that an understanding of the root causes of climate change leads to better choices regarding mitigation (Bowers et al., 2016). Finally, an examination of data over long time periods allows for the patterns of climate change to be more easily ascertained. This overcomes the problem of humans having difficulty noticing the impacts of climate change over their personal lifetime (Brownlee et al., 2013; Fortner, 2001).

Elaborate

To improve and extend student understanding of climate concepts and test their hypotheses developed during the *Explore* phase, students were presented with ocean data from different Ocean Networks Canada coastal observatories. For example, to test their hypothesis developed at the gas solubility station (e.g., *As temperature increases/or decreases, the solubility and availability of oxygen declines/or increases*), the students were presented with data on ocean temperature and oxygen concentration from a coastal B.C. observatory. Likewise, to test their hypothesis developed at the Arctic sea ice station (e.g., *Increases in global temperatures have dramatic effects on sea ice and the ecosystem and communities that depend upon the sea ice*), the students were presented

with data on sea ice dynamics and temperature from a coastal Arctic station in Cambridge Bay, Nunavut, Canada. With enough time and teacher scaffolding, the students determined how to test their hypotheses with the data. For example, students plotted oxygen concentration with respect to temperature and found that it supported the hypothesis that as temperature increases, the availability of oxygen declines. However, analysis of the eight-year data set on sea ice dynamics and temperature from Cambridge Bay did not support their hypothesis regarding the impact of temperature on sea ice. This data set, given its relatively short duration, showed more influence of inter-annual variability than a discernible long-term trend. This provided an ideal opportunity to discuss the value of long-term data sets and explain that Inuit TEK represents a unique long-term data set of Inuit observations of sea ice.

Elder and Environment

Inuit are strongly connected to their local environment and have maintained a collective memory of nature via their shared oral histories and cultural stories that have passed through generations since time immemorial (Brownlee et al., 2013). Inuit knowledge of climate change represents the longest human record of observations in the Canadian Arctic and is an invaluable source of information on change, adaptation, mitigation, and survival (Gérin-Lajoie et al., 2016). With respect to sea ice, this detailed knowledge is essential to supporting today's transportation, hunting, recreation and cultural activities, in addition to informing long-term understanding of how climate change is affecting the Arctic Ocean environment. During a project to understand changing sea-ice in the region (Polar Knowledge Canada funded study, M. Hoeberechts et al.) Inuit knowledge holders from three communities (Kugluktuk, Cambridge Bay, and Gjoa Haven) in the Kitikmeot Region, Nunavut shared their observations of changes in the sea ice and how these changes are impacting their way of life. These observations were presented to the students. Through this aspect of the lesson, students were introduced to the idea that scientific data can be complemented by other sources of knowledge, which adds richness to the understanding of complex phenomena and addresses a key curricular competency in the B.C. Curriculum (to apply First Peoples perspectives and knowledge as other ways of knowing and sources of information). This TEK helped students evaluate hypotheses they formulated during the Arctic sea ice hands-on activity. For southern students, who may not yet perceive the extent of climate change impacts on their daily lives, the observations shared by Nunavummiut can appeal to their altruistic value systems as they are exposed to people and communities currently experiencing disproportionate impacts of climate change. Sharing these realities can have the further effect of facilitating pro-environmental behaviour, such as mitigation (Busch et al., 2019; Monroe et al., 2019).

Lesson Conclusion

Education on climate change is intended to improve knowledge of climate change and motivate students to reduce their GHG emissions. It is not intended to leave students in a state of despair (Duffy et al., 2019; Kelsey & Armstrong, 2012). With this in mind, the final phase of the lesson was devoted to a student-led discussion with the aim of empowering them to build on their knowledge and propose effective and immediate personal actions to reduce GHG emissions in their local community.

Because we were visitors in their classroom, we did not have the time to fully develop this discussion with the students. However, we encouraged the teacher and students to continue the discussion as this phase of the lesson has several theoretical benefits. First, it allows students to express their emotions regarding climate change and action; such expression is an important first step toward addressing environmental problems (Barrows, 1998). Having students express their emotions within the classroom is also beneficial as educators can respect and/or validate their emotions which, in turn, improves overall learning and action (Ojala, 2016). For example, a common frustration students express is that their individual actions are insignificant compared to the magnitude of the problem (Kenis & Mathijs, 2012). As educators, we can validate this frustration; however, we can also model how we cope with this frustration. In the case of the lesson outlined above, we discussed the responsibilities of citizenship in a global society (Westheimer, 2015) as well as “bright spots” (Duffy et al., 2019) in human history where collective action solved or alleviated problems.

Second, giving students autonomy to critique their local community and envision a better future can convey the message that their ideas are valuable (Haynes & Tanner, 2015; Kenis & Mathijs, 2012; Woolfolk et al., 2009). This can boost their self-determination and motivation, and it can empower them to create change/be the change they want to see (Kelsey & Armstrong, 2012; Kenis & Mathijs, 2012; Ojala, 2016; Trott, 2019; Woolfolk et al., 2009). It can also shed light on the complexities of climate mitigation (e.g., ethical, economic, sociological, political) and the need for focusing our efforts here rather than debunking accepted climate science (Busch et al., 2019). Finally, it allows for an informal assessment of their understanding of the foundational concepts of climate change: If their understanding were complete, then they would make effective choices that impact the climate system (Bofferding & Kloser, 2015; Karpudewan et al., 2015) and be considered climate literate (Duffy et al., 2019).

Evaluation

The primary goal of the lesson was to improve understanding of some key climate and ocean–climate facts. Prior to the lesson, we gave the students a quiz, which we then repeated with them after the lesson. We used a quiz as this is a format with which students are familiar. Students provided their written

answers to seven questions on basic climate and ocean–climate science (Table 1). The quiz, as given to students, is provided in Appendix A. Written answers were graded (i.e., assigned a mark) using the answer key (Table 1). The *before-lesson* and *after-lesson* grades for each class were the basis of our analysis of the lesson’s effectiveness (i.e., its ability to improve understanding of basic climate and ocean–climate facts). An example of the data (grades) from one classroom is provided in the Appendix B. With the exception of two instances, all students provided written answers to the questions. In one instance, the teacher forgot to provide the students with a question. In the other instance, there was an undetected typographical error in one question which made the question difficult to interpret; for this instance, answers were not included in our analysis. For each class, paired t-tests and a significance level of 5% were used to determine if before and after grades were significantly different (Zar, 1984). An example of the results of a paired t-test for one classroom is provided in Appendix C.

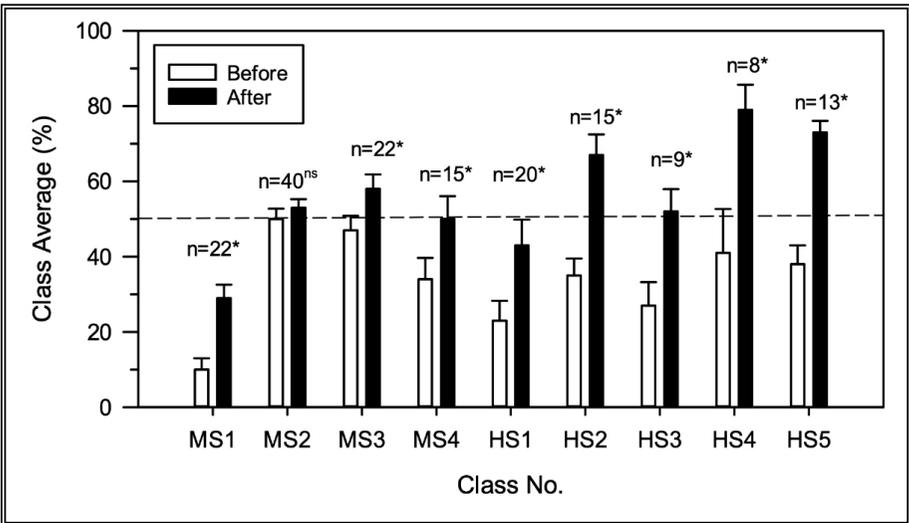
Question	Answer Key (<i>total possible mark</i>)
1. What is the definition of a greenhouse gas?	A gas that absorbs and emits infrared radiation (1)
2. The most important man-made greenhouse gas is considered to be:	Carbon dioxide (1)
3. What two human activities lead to carbon dioxide increasing in the atmosphere?	Deforestation and burning fossil fuels (2)
4. In Canada, what are the main sources of carbon dioxide emissions?	Transportation and stationary combustion (manufacturing, residential, commercial/ institutional, oil and gas production, refineries) (2)
5. List two impacts of warming on the ocean	Reduced oxygen, sea ice melting (other answers are possible e.g. habitat range changes, coral reef die-offs, food web changes, sea-level rise) (2)
6. What causes ocean acidification?	Carbon dioxide gas reacting with seawater (1)
7. What does ocean acidification do to marine biota with calcium carbonate shells?	Makes it harder for them to make their shells; dissolves their shells (1)

Note. These questions were provided before and after the lesson. Students accessed the information for questions 1-4 and 5-7 through the presentation and hands-on activities, respectively.

Table 1 *Quiz Questions (And Answer Key) Used to Evaluation Understanding of Some Basic Climate and Ocean-Climate Science Facts.*

Results and Discussion

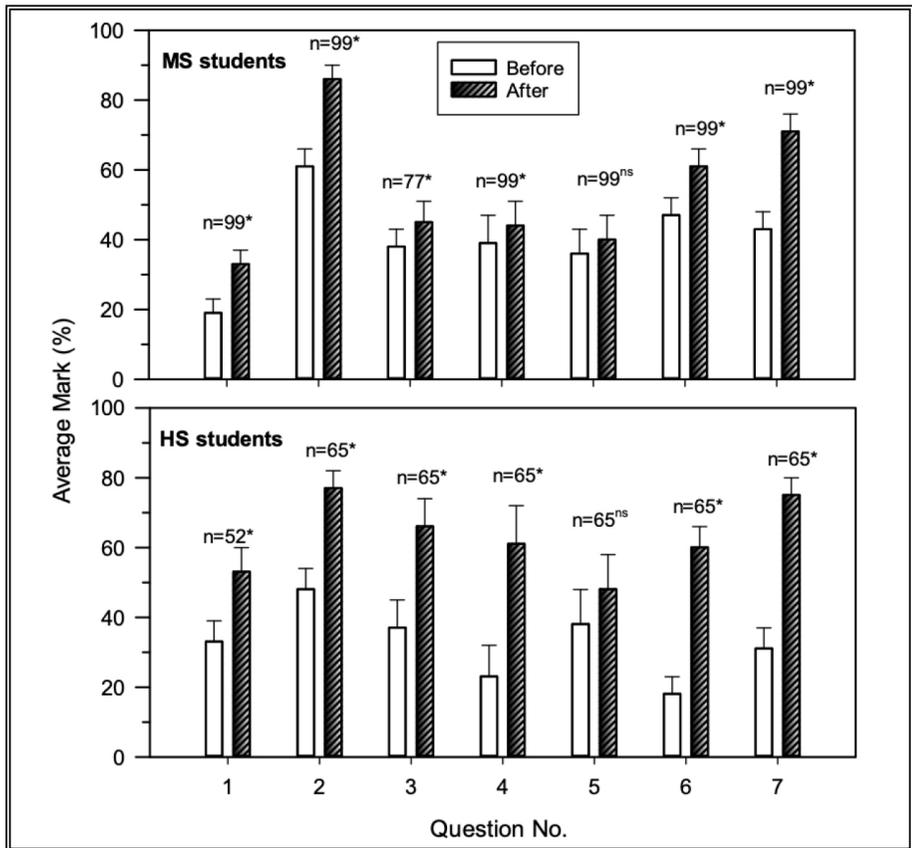
Middle school (MS) and High school (HS) students' before-lesson understanding of basic concepts and information regarding climate science was low (Fig. 1). If 50% is considered a passing grade, then the before-lesson class averages indicate that all classes but one had a failing grade. Questions 1 to 4 were selected as basic climate change science knowledge that would be expected in any course covering climate science in Canada. Questions 5 to 7 pertain specifically to the ocean and are not found in mandatory courses of the B.C. curriculum; therefore, the content is less likely to have been taught by teachers prior to our lesson. However, *before-lesson* averages for questions 5 to 7 were similar to *before-lesson* averages for questions 1 to 4 (Fig. 2). The low (i.e., < 50%) *before-lesson* average grades among the MS (Grades 6–8) students were not surprising. Within the B.C. K–8 curriculum, Science 7 is the only mandatory course that specifically includes climate science. Prior to our lesson, MS1 (composed of Grade 6 and 7 students) had not yet received formal instruction in climate science, and this would explain their low level of *before-lesson* understanding. Typically, students with more science classes have more knowledge of climate science (Busch et al., 2019). The other MS



Note. Dashed line denotes an average grade of 50%. MS1–4 are middle school classes (MS1—Grade 6/7, MS2—Grade 7, MS3,4—Grade 8). HS1–5 are high school classes (HS1,2,3—Grade 10, HS4,5—Grade 12). For each class, the sample size (n = number of students in class) is denoted and whether *before-lesson* and *after-lesson* marks were significantly different (paired t -tests: ns and * refer to not significantly and significantly different, respectively).

Figure 1. Class Average Marks (\pm S.E.) for Each Class Before and After the Climate Lesson

classes (Grades 7 and 8) had received formal climate science education once previously (MS2 just prior to our lesson, and MS3,4 the year before) which may explain their higher *before-lesson* average grades (compared to MS1). It is surprising that the HS students had low *before-lesson* average grades as they certainly had received more science education than the MS students. Identifying reasons for low *before-lesson* understanding among HS students was beyond the scope of this study but does warrant further investigation as it suggests that HS students may graduate with an inadequate understanding of basic concepts regarding climate change science. Certainly, recent data showing that a large portion of the general Canadian public do not understand climate change support this conclusion (Field et al., 2019).



Note. For each question, the sample size (n = total number of students) is denoted and whether *before-lesson* and *after-lesson* marks were significantly different (paired t -tests: *ns* and * refer to not significantly and significantly different, respectively).

Figure 2. Average Marks (\pm S.E.) for Each Question, Before and After the Climate Lesson, for Middle School (MS) and High School (HS) Students

With the exception of one class, the climate lesson led to significant improvements in the understanding of climate change science (Fig. 1). Among the students assessed, the level of understanding after the lesson was age-related (Fig. 3). The classes with the lowest (29%) and highest (73–79%) after-lesson class averages were the classes composed of the youngest (MS1—Grades 6 and 7) and oldest students (HS4,5—Grade 12), respectively. All the other classes, composed of Grades 7, 8, and 10 students, developed a level of understanding that was between these extremes (Fig. 2, 3).

One possible explanation for the age-related difference in improvement in understanding is that some of the fundamental concepts of climate change are abstract, and the cognitive developmental stage of younger students prevents these students from fully understanding climate concepts (Fortner, 2001; Strickhouser et al., 2017). Examining the data by question indicates that the MS students didn't develop the level of understanding that the HS students developed because they didn't do as well on questions 1, 3, and 4 (Fig. 2). This is likely because the information necessary for accurately answering questions 1, 3, and 4 wasn't made available in a manner fitting for the MS students' cognitive developmental stage. The information for questions 1, 3, and 4 was available from presentation slides (note that although information for question 2 was also available from presentation slides, it is likely that MS students attained a high level of understanding for question 2 because they had a good understanding of the question before the lesson). In contrast to the hands-on activities, where learning occurs through tangible interaction with materials, learning from presentation slides requires more abstract thinking. Research on cognitive development indicates that children (McMahan & Thompson, 2015), beginning at 11–12 years old, are developing an abstract system of logic to understand the world. However, whether they use this system effectively depends on various factors, such as time provided for solving the problem and the content of a problem. Problems that are not personally relevant or do not align with children's own thinking are less likely to be processed correctly. Overall mental ability increases with age; adolescents have a more developed abstract system of logic, faster processing speeds, better working memory and fluid intelligence, and better divided and selective attention.

Following research on cognitive development (McMahan & Thompson, 2015), MS student understanding of questions 1, 3, and 4 would improve if they were given more time to process the information on these slides, if the information on the slides was made more personally relevant, and if time was allotted to discussing information with respect to their prior thinking. Dynamic visualizations might also help to improve understanding of abstract climate science concepts (Hestness et al., 2014). Nevertheless, the results indicate that the lesson led to significant gains in the understanding of climate change science among MS and HS students, and higher *after-lesson* levels of understanding of climate science among HS students.

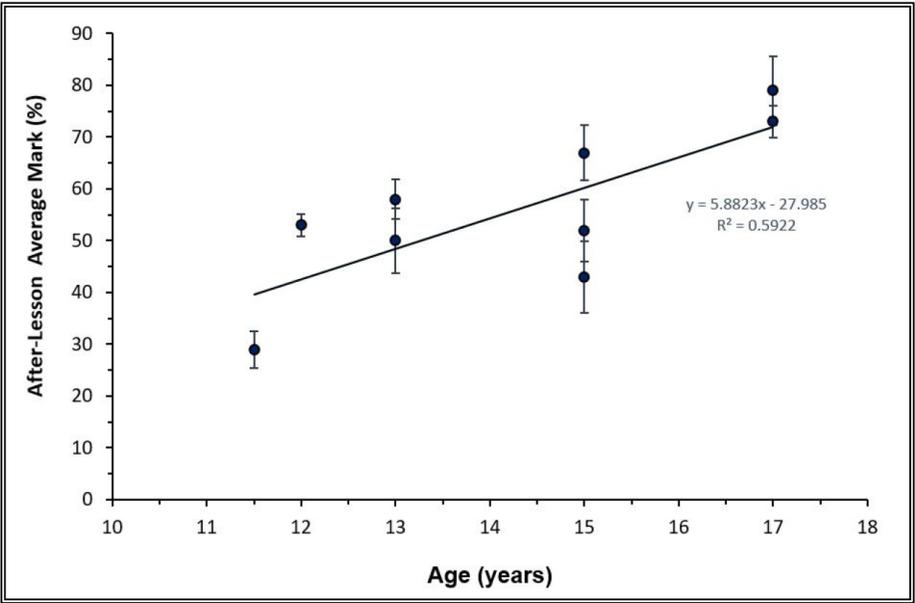


Figure 3. Class Average Marks (\pm S.E.) After the Climate Lesson

From the outset, we designed the lesson so that teachers could readily use it in their classroom, and so that students could increase their understanding of climate science in order to propose effective and immediate personal actions to reduce GHG emissions in their local community. Based on a variety of anecdotes and feedback, the teachers found the lesson useful. During the final phase of the lesson, we had enough time for a short student-led discussion. In general, the students proposed effective and immediate personal actions to reduce GHG emissions in their local community. For example, solutions by this group of students (<https://youtu.be/8d3lnEEBoco>) are representative of the solutions proposed by MS and HS students. Given that youth have the capacity to inform decision making, communicate risks, and facilitate action (Haynes & Tanner 2015; Lawson et al., 2018), we encouraged classroom teachers to provide more time and space for students to develop their ideas and create climate action projects in their local community. Locally relevant climate action projects have many advantages. For example, they can create a sense of agency in students, which can in turn sustain students' interest and inspire their active participation (Trott, 2019). They can also lead to higher order thinking (vis-à-vis Bloom's taxonomy), and they can contribute to environmental citizenship and a "We can fix it" focus (Wynes & Nicholas, 2019, p. 14). In the process, students exercise attitudes articulated in the PCSC (e.g., work collaboratively in carrying out investigations as well as in generating and evaluating ideas; be

sensitive to and responsible about maintaining a balance between the needs of humans and a sustainable environment; become aware of the consequences of their actions; appreciate the role and contribution of science and technology in our understanding of the world). With respect to the B.C. curriculum, students can exercise competencies such as: a) considering the social, ethical, and environmental implications of the findings from their own and others' investigations; and b) contributing to care for self, others, community, and world through personal or collaborative approaches.

While the lesson examined in this study improved understanding of climate change and the ocean–climate nexus among MS and HS students assessed, it is important to acknowledge the limitations of this study. For example, the sample size was small and non-randomized (i.e., we were contacted by teachers interested in receiving our climate lesson). Thus, the students in this study were not representative of students in B.C. or in Canada. The study also used the same quiz for evaluating improvement in understanding. A potential limitation of this assessment strategy is that it may have led to before-evaluation learning. Moreover, the wording of questions may have posed difficulty for some students. While the study did assess improvement in understanding, there was no evaluation of the longer-term retention of this understanding. A more detailed assessment study would address the limitations of the present study.

Conclusion

As stated by the United Nations, “climate change is the defining issue of our time, and we are at a defining moment” (UN, 2018). At present, Canadians do not have a complete understanding of climate change (Field et al., 2019) and yet this understanding is needed to acquire citizen endorsement of government mitigation programs and to reduce individual GHG emissions. Formal education is key to advancing this understanding. As Canadian provinces and territories revise their K–12 curriculum documents, climate change education (that includes the ocean) must be a priority. Given that curriculum documents are typically revised approximately every 15 years (Wynes & Nicholas, 2019), and that carbon dioxide emissions must be reduced by 45% (of 2010 levels) in the next nine years, curriculum revisions for climate change education must be expedited. Teachers face challenges with regard to teaching climate change science in general and the climate–ocean nexus in particular. They would not only benefit from professional development on climate change education but also from researched, tested, and effective classroom-ready resources on this critical issue. Ideally, this research would bring together educators, research scientists, and education and climate policy makers, and it would incorporate resources and lessons learned from the diversity of non-governmental organizations and informal educators across the country. Such educational resources would vastly improve climate change education teaching capacity across Canada at a critical

time and would contribute to Canada's ocean literacy initiatives within the UN Decade of Ocean Science for Sustainable Development.

Acknowledgements

The authors thank the anonymous reviewers for their constructive comments and the community members in Kugluktuk, Cambridge Bay, and Gjoa Haven in Kitikmeot Region, Nunavut, Canada for sharing observations of climate change in the Canadian Arctic. Ocean Networks Canada is funded by the Canada Foundation for Innovation, the Government of Canada, Natural Resources Canada, Fisheries & Oceans Canada, CANARIE, the Government of British Columbia, the University of Victoria, and many others. This study was specifically supported through NSERC PromoScience (for lesson development, delivery, and evaluation) and Polar Knowledge Canada (for the study of changing sea ice in Nunavut). Data contained in Figures 1 and 2 have been reviewed by the Human Research Ethics Board, Office of Research Services at the University of Victoria.

Footnotes

- ¹ Ocean Networks Canada is an initiative of the University of Victoria that uses cabled observatories, remote control systems, interactive sensors, and big data management to monitor the geological, physical, chemical, and biological oceanography of the west and east coasts of Canada and the Arctic. The data are used for scientific research to help communities, governments, and industry make informed decisions on ocean management, disaster mitigation, and environmental protection and are also available to anyone interested in the ocean.

References

- Anderson, A. (2010). *Combating climate change through quality education*. The Brookings Institution. <https://www.brookings.edu/research/combating-climate-change-through-quality-education/>
- Barrows, A. (1998). Crying for the manatees. *ReVision*, 20(4).
- Bernabei, M., Calder, T., & Sedgwick, S. (2019). *Secondary science First Peoples teacher resource guide*. First Nations Education Steering Committee and First Nations School Committee. <http://www.fnesc.ca/sciencetrng/>
- Bieler, A., Haluza-Delay, R., Dale, A., & McKenzie, M. (2018). A national overview of climate change education policy: Policy coherence between subnational climate and education policies in Canada (K-12). *Journal of Education for Sustainable Development*, 11(2), 63-85. <https://doi.org/10.1177/0973408218754625>

- Bofferding, L., & Kloser, M. (2015). Middle and high school students' conceptions of climate change mitigation and adaptation strategies. *Environmental Education Research, 21*(2), 275-294. <https://doi.org/10.1080/13504622.2014.888401>
- Bond, L. F., Elias, M. J., & Nayman, S. J. (2021). Empowering students for social action in social studies. *Phi Delta Kappan, 102* (5), 42-46. <https://doi.org/10.1177/0031721721992565>
- Bowers, A. W., Monroe, M. C., & Adams, D. C. (2016). Climate change communication insights from cooperative extension professionals in the US Southern states: Finding common ground. *Environmental Communication, 10*(5), 656-670. <https://doi.org/10.1080/17524032.2016.1176947>
- Brownlee, M. T., Powell, R. B., & Hallo, J. C. (2013). A review of the foundational processes that influence beliefs in climate change: Opportunities for environmental education research. *Environmental Education Research, 19*(1), 1-20. <https://doi.org/10.1080/13504622.2012.683389>
- Busch, K. C., Henderson, J. A., & Stevenson, K. T. (2019). Broadening epistemologies and methodologies in climate change education research. *Environmental Education Research, 25*(6), 955-971. <https://doi.org/10.1080/13504622.2018.1514588>
- Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). *The BSCS 5E instructional model: Origins and effectiveness*. Office of Science Education National Institutes of Health. https://media.bsccs.org/bsccsmw/5es/bsccs_5e_full_report.pdf
- Council of Ministers of Education Canada (CMEC). (1997). *The common framework of science learning outcomes: K to 12 / Pan-Canadian science project*. <https://science.cmec.ca/framework/Pages/english/CMEC%20Eng.html>
- Duffy, M. A., Hammond, J. W., & Cheng, S. J. (2019). Preaching to the choir or composing new verses? Toward a writerly climate literacy in introductory undergraduate biology. *Ecology and Evolution, 9*(22), 12360-12373. <https://doi.org/10.1002/ece3.5736>
- Environment and Climate Change Canada (2016). *Canada's mid-century long-term low-greenhouse gas development strategy*. Government of Canada. https://unfccc.int/files/focus/long-term_strategies/application/pdf/canadas_mid-century_long-term_strategy.pdf
- Field, E., Schwartzberg, P., & Berger, P. (2019). *Canada, climate change and education: Opportunities for public and formal education*. <http://lsf-1st.ca/en/cc-survey>
- Flick, L. B. (1993). Meanings of hands-on science. *Journal of Science Teacher Education, 4*(1), 1-8.
- Flora, J. A., Saphir, M., Lappé, M., Roser-Renouf, C., Maibach, E. W., & Leiserowitz, A. A. (2014). Evaluation of a national high school entertainment education program: The Alliance for Climate Education. *Climatic Change, 127*(3-4), 419-434. <https://doi.org/10.1007/s10584-014-1274-1>
- Fortner, R. W. (2001). Climate change in school: Where does it fit and how ready are we? *Canadian Journal of Environmental Education, 6*(1), 18-31. Retrieved from <https://cjee.lakeheadu.ca/article/view/285>
- Gérin-Lajoie, J., Cuerrier, A., Collier, L. S. (Eds.) (2016). *"The caribou taste different now": Inuit Elders observe climate change*. Nunavut Arctic College Media.
- Glithero, L. (2020). *Understanding ocean literacy in Canada: National Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/08/COLC_National-Report_Final_2020.pdf

- Gold, A. U., Kirk, K., Morrison, D., Lynds, S., Sullivan, S. B., Grachev, A., & Persson, O. (2015). Arctic climate connections curriculum: A model for bringing authentic data into the classroom. *Journal of Geoscience Education*, 63(3), 185-197. <https://doi.org/10.5408/14-030.1>
- Greengrove, C., Lichtenwalner, S., Palevsky, H., Pfeiffer-Herbert, A., Severmann, S., Soule, D., Murphy, S., Smith, L.M., & Yarincik, K. (2020). Using authentic data from NSF's Ocean Observatories Initiative in undergraduate teaching: An invitation. *Oceanography*, 33(1), 62-73. <https://doi.org/10.5670/oceanog.2020.103>
- Guy, S., Kashima, Y., Walker, I., & O'Neill, S. (2014). Investigating the effects of knowledge and ideology on climate change beliefs. *European Journal of Social Psychology*, 44(5), 421-429. <https://doi.org/10.1002/ejsp.2039>
- Haynes, K. & Tanner, T. M. (2015) Empowering young people and strengthening resilience: youth-centred participatory video as a tool for climate change adaptation and disaster risk reduction. *Children's Geographies*, 13(3), 357-371. <https://doi.org/https://doi.org/10.1080/14733285.2015.848599>
- Hestness, E., McDonald, R. C., Breslyn, W., McGinnis, J. R., & Mouza, C. (2014). Science teacher professional development in climate change education informed by the next generation science standards. *Journal of Geoscience Education*, 62(3), 319-329. <https://doi.org/10.5408/13-049.1>
- Hoegh-Guldberg, O. (2015). *Reviving the ocean economy: The case for action - 2015*. WWF International. https://c402277.ssl.cf1.rackcdn.com/publications/790/files/original/Reviving_Ocean_Economy_REPORT_low_res.pdf?1429717323
- Hoegh-Guldberg, O., Caldeira, K., Chopin, T., Gaines, S., Haugan, P., Hemer, M., Howard, J., Konar, M., Krause-Jensen, D., Lindstad, E., Lovelock, C. E., Michelin, M., Nielsen, F. G., Northrop, E., Parker, R., Roy, J., Smith, T., Some, S., & Tyedmer, P. (2019). *The ocean as a solution to climate change: Five opportunities for action*. World Resources Institute. https://oceanpanel.org/sites/default/files/2019-10/HLP_Report_Ocean_Solution_Climate_Change_final.pdf
- Hoffman, A. J. (2011). The culture and discourse of climate skepticism. *Strategic Organization*, 9(1), 77-84. <https://doi.org/10.1177/1476127010395065>
- Holstermann, N., Grube, D., & Bogeholz, S. (2010). Hands-on activities and their influence on students' interest. *Research Science Education*, 40, 743-757. <https://doi.org/10.1007/s11165-009-9142-0>
- Intergovernmental Panel on Climate Change (IPCC). (2007). *Climate Change 2007: The physical science basis*. Cambridge University Press. <https://www.ipcc.ch/report/ar4/wg1/>
- Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014: Synthesis report. Contribution of working groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* <https://www.ipcc.ch/report/ar5/syr/>
- Intergovernmental Panel on Climate Change. (2018). Summary for Policymakers. In V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, & T. Waterfield (Eds.), *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global*

response to the threat of climate change, sustainable development, and efforts to eradicate poverty. World Meteorological Organization. <https://www.ipcc.ch/sr15/>

- Karpudewan, M., Roth, W.-M., & Abdullah, M. N. S. B. (2015). Enhancing primary school students' knowledge about global warming and environmental attitude using climate change activities. *International Journal of Science Education*, 37(1), 31-54. <https://doi.org/10.1080/09500693.2014.958600>
- Kelsey, E., & Armstrong, C. (2012). Finding hope in a world of environmental catastrophe. In A. E.J. Wals & P. B. Corcoran (Eds.), *Learning for sustainability in times of accelerating change* (pp. 187-200). Wageningen Academic Publishers. <https://doi.org/10.3920/978-90-8686-757-8>
- Kenis, A., & Mathijs, E. (2012). Beyond individual behaviour change: The role of power, knowledge and strategy in tackling climate change. *Environmental Education Research*, 18(1), 45-65. <https://doi.org/10.1080/13504622.2011.576315>
- Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., Strnad, R., & Seekamp, E. (2018). Intergenerational learning: Are children key in spurring climate action? *Global Environmental Change*, 53, 204-208. <https://doi.org/10.1016/j.gloenvcha.2018.10.002>
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C., & Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature Climate Change*, 5(11), 1014-1020. <https://doi.org/10.1038/nclimate2728>
- Lehnert, M., Fiedor, D., Frajer, J., Hercik, J., & Jurek, M. (2019). Czech students and mitigation of global warming: beliefs and willingness to take action. *Environmental Education Research*, 26(6), 864-889. <https://doi.org/10.1080/13504622.2019.1694140>
- Lemmen, D. S., Warren, F. J., James, T. S., & Mercer Clarke, C. S. L. (2016). *Canada's marine coasts in a changing climate*. Government of Canada. https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/files/pdf/NRCAN_fullBook%20%20accessible.pdf
- McBean, G. A., & Hengeveld, H. G. (2000). Communicating the science of climate change: A mutual challenge for scientists and educators. *Canadian Journal of Environmental Education*, 5(1), 9-23. <https://cjee.lakeheadu.ca/article/view/298>
- McKinley, G. A., Fay, A. R., Eddebbar, Y. A., Gloege, L., & Lovenduski, N. S. (2020). External forcing explains recent decadal variability of the ocean carbon sink. *AGU Advances*, 1(1), Article e2019AV000149. <https://doi.org/10.1029/2019AV000149>
- McMahan, I., & Thompson, S. (2015). *Adolescence* (Canadian Edition). Pearson.
- McPherson, K., Wright, T., & Tyedmers, P. (2020). Challenges and prospects to the integration of ocean education into high school science courses in Nova Scotia. *Applied Environmental Education & Communication*, 19(2), 129-140. <https://doi.org/10.1080/1533015x.2018.1533439>
- Monroe, M. C., Plate, R. R., Oxarart, A., Bowers, A., & Chaves, W. A. (2019). Identifying effective climate change education strategies: A systematic review of the research. *Environmental Education Research*, 25(6), 791-812. <https://doi.org/10.1080/13504622.2017.1360842>
- Nazir, J., Pedretti, E., Wallace, J., Montemurro, D., & Inwood, H. (2011). Reflections on the Canadian experience with education for climate change and sustainable development. *Canadian Journal of Science, Mathematics, and Technology Education*, 11(4), 365-380. <https://doi.org/10.1080/14926156.2011.624673>
- Ojala, M. (2016). Facing anxiety in climate change education: From therapeutic practice to hopeful transgressive learning. *Canadian Journal of Environmental Education*, 21, 41-56. <https://files.eric.ed.gov/fulltext/EJ1151866.pdf>

- Shi, J., Visschers, V. H., Siegrist, M., & Arvai, J. (2016). Knowledge as a driver of public perceptions about climate change reassessed. *Nature Climate Change*, 6(8), 759-762. <https://doi.org/10.1038/nclimate2997>
- Sloane, J. D., & Wiles, J. R. (2020). Communicating the consensus on climate change to college biology majors: The importance of preaching to the choir. *Ecology and Evolution*, 10(2), 594-601. <https://doi.org/10.1002/ece3.5960>
- Strickhouser, N., Roychoudhury, A., Hirsch, A. S., & Mehta, J. (2017). Teaching informed by conceptual difficulties with understanding the greenhouse effect. In D. P. Shepardson, A. Roychoudhury, & A. Hirsch (Eds.), *Teaching and learning about climate change. A framework for educators* (pp. 203-214). Routledge.
- Stewart, A. (2019). Ocean literacy matters in Canada. *The Journal of Ocean Technology*, 14(2), 112-121.
- Tolppanen, S., Claudelin, A., & Kang, J. (2020). Pre-service teachers' knowledge and perceptions of the impact of mitigative climate actions and their willingness to act. *Research in Science Education*. <https://doi.org/10.1007/s11165-020-09921-1>
- Trott, C. D. (2019). Children's constructive climate change engagement: empowering awareness, agency, and action. *Environmental Education Research*, 26(4), 532-554. <https://doi.org/10.1080/13504622.2019.1675594>
- Trott, C. D. & Weinberg, A. E. (2020). Science education for sustainability: Strengthening children's science engagement through climate change learning and action. *Sustainability*, 12(16), 6400. <https://doi.org/10.3390/su12166400>
- United Nations (UN). (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*. <https://sustainabledevelopment.un.org/post2015/transformingourworld/publication>
- United Nations. (2017). *First global integrated marine assessment*. Cambridge University Press.
- United Nations. (2018). Climate Change. Retrieved from <https://www.un.org/en/global-issues/climate-change>
- Watkins, K. (2007). *Human development report 2007/2008. Fighting climate change: Human solidarity in a divided world*. United Nations Development Programme. http://hdr.undp.org/sites/default/files/reports/268/hdr_20072008_en_complete.pdf
- Westheimer, J. (2015). *What kind of citizen? Educating our children for the common good*. Teachers College Press.
- Woolfolk, A. E., Winne, P. H., & Perry, N. E. (2009). *Educational psychology* (4th ed.). Pearson.
- Wynes, S., & Nicholas, K. A. (2019) Climate science curricula in Canadian secondary schools focus on human warming, not scientific consensus, impacts or solutions. *PLoS ONE*, 14(7), Article e0218305. <https://doi.org/10.1371/journal.pone.0218305>
- Zar, J. H. (1984). *Biostatistical analysis* (2nd ed.). Prentice-Hall.



Evaluation

What is your current knowledge of greenhouse gases and impacts of warming and carbon dioxide on the ocean? Please answer the questions below to the best of your ability. Do not use electronic devices or textbooks to find answers. Answer questions on your own.

Student Name: _____

1. What is the definition of a greenhouse gas?

2. The most important man-made greenhouse gas is considered to be:

3. What two human activities lead to carbon dioxide increasing in the atmosphere?

4. In Canada, what are the main sources of carbon dioxide emissions?

5. List two impacts of warming on the ocean:

6. What causes ocean acidification?

7. What does ocean acidification do to marine biota with calcium carbonate shells?

Ocean Networks Canada | oceannetworks.ca
University of Victoria Queenswood Campus
#100-2474 Arbutus Road, Victoria, BC V8N 1V8

Appendix A. Quiz, to assess basic knowledge, given to students.

St. No.	Q1 (b)	Q1 (a)	Q2 (b)	Q2 (a)	Q3(b)	Q3(a)	Q4(b)	Q4(a)	Q5(b)	Q5(a)	Q6(b)	Q6(a)	Q7(b)	Q7(a)	Total Mark Before	% Grade Before	Class Avg (%) Before (± sd)	Total Mark After	% Grade After	Class Avg (%) After (± sd)
1	0	0	1	1	1	2	0	2	0	1	1	0	0	1	3	30	34	7	70	50
2	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	22	3	30	24
3	0	0	1	1	1	2	0	2	0	0	0	0	0	1	2	20		6	60	
4	1	0	0	1	1	1	0	1	0	0	0	0	1	1	3	30		4	40	
5	1	1	1	1	1	1	1	2	1	1.5	0.5	1	1	1	6.5	65		8.5	85	
6	0	0	1	1	0	1	0	1	0	0	0	1	0	1	1	10		5	50	
7	0	0	0	1	0	0	0	0	2	0	0.5	0	0	0	2.5	25		1	10	
8	0	1	1	1	1	1	0	1	0	1	1	1	1	1	4	40		7	70	
9	0	0	0	1	0	1	0	1	0	0	0	1	0	1	0	0		5	50	
10	0	0	0	1	2	2	1	2	0	0	0	0	1	1	4	40		6	0	
11	1	0	1	1	1	2	2	2	1	1	0	1	1	1	7	70		8	80	
12	0	0	1	1	1	1	2	1	0	1	0	1	1	0	5	50		5	50	
13	0.5	0	1	1	1	1	2	2	1	1	0	0	1	1	6.5	65		6	60	
14	0	0	1	1	1	1	0	2	1	0	0	1	0	1	3	30		6	60	
15	1	0	1	1	1	1	0	0	0	0	0	1	1	1	4	40		4	40	

Appendix B. Example data from classroom MS4. This classroom had a total of 15 students. Each student was assigned a number (St. No.). Students were given the same quiz before and after the lesson. See Table 1 for questions, and total possible marks per question. Grades are listed by question (Q). Grades earned before and after the lesson denoted as “b” and “a”, respectively.

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean
% Grade Before	15	34.33	22.03	5.69
% Grade After	15	50.33	23.79	6.14

St. No.	% Grade Before	% Grade After
1	30	70
2	0	30
3	20	60
4	30	40
5	65	85
6	10	50
7	25	10
8	40	70
9	0	50
10	40	0
11	70	80
12	50	50
13	65	60
14	30	60
15	40	40

Estimation for Paired Difference

Mean	StDev	SE Mean	95% CI for $\mu_{\text{difference}}$
-16.00	24.80	6.40	(-29.73, -2.27)

$\mu_{\text{difference}}$: mean of (C2 - C3)

Test

Null hypothesis $H_0: \mu_{\text{difference}} = 0$

Alternative hypothesis $H_1: \mu_{\text{difference}} \neq 0$

T-Value	P-Value
-2.50	0.026

Appendix C. Example paired t-test results for classroom MS4.

What Do Ranchers and Heavy-Duty Mechanics Say to the Ocean?

Karen Tamminga-Paton, Crowsnest Pass, Alberta



I live in the mountainous landscape of southwestern Alberta, about as far from the sea as one can be. What do ranchers, heavy-duty mechanics, teachers, and secretaries from this part of Canada *say* to the ocean? How do we see Canada's extensive coastal waters in relation to our wheat fields and coalmines? Admittedly, the inquiry became personal; I had not considered Canada as an ocean nation.

In my hopes to engage all kinds of individuals in conversations about their relationship with the ocean, I painted a three-part piece that was intentionally large and visually accessible for us *inlanders*: a single humpback whale to represent Ocean; a grouping of hands representative of Humanity; and three strips of overlapping canvas for the conversation between the two. The intent was to invite community members to write their imagined dialogue onto these strips. Prior to the global pandemic, arrangements had been made at Calgary's new Central Library, a cafe in Lethbridge, a rural K-12 school, and several smaller local gatherings with the hopes of accessing and interacting with a broad demographic. I ran pilot "test runs" at a coffee shop, a seniors' complex, and a fellow artist's studio. But social restrictions took place the day a group of enthusiastic kindergarteners visited my studio to "talk to the whale," and the day before I was to head into Calgary; as the pandemic spread across the globe, my access to Alberta's free-ranging populous was suddenly cut off.

Social media became my new platform to gather contributions. Invitations to contribute through personal emails, Instagram, and Facebook were open to anyone from the three prairie provinces. I noticed a marked difference in comments from all three social media platforms. Now, individuals had time to think about what they wanted to say. Some pondered the question for weeks, had conversations together, played with ideas, and gathered quotes. Original poetry and songs were created. Entire families got involved. Individuals within their circle were invited to participate. Everything that was sent to me was transcribed onto the canvas strips with permanent coloured markers. Each contributor received a photo of their comment so they could visualize their words amongst the others. An unexpected outcome was the cohesive nature of the writing. As the lone scribe, I could lay out text as its own design element. Sentences wove in and out of undulating lines created by papers collaged onto the canvas strips to provide compositional structure. I was also able to ensure that each contribution was legible, even where one overlapped with another—something that would have been difficult to ensure under my original plan.

The middle "conversation" piece is composed of two narrower strips of canvas pinned over a larger base canvas. Colours from the two flanking paintings, Ocean and Humanity, were applied to unify the entire piece. It is on this piece that the kindergartners wrote their words to the whale. Their large, wobbly letters interact with selected fragments of text I found particularly poignant, repeated over and over for emphasis. These words, combined with the handwritten words of the very young, seemed a fitting foundation for the thoughtful, provocative lines contributed by so many individuals.

What Was Accomplished?

There were conversations. Memories were evoked and stories were shared, some of which I was privileged to hear. But more importantly, I participated in the asking of searching questions. What actually got written on these canvases

was a fraction of what was spoken. How does one measure that? One individual shared that she and her friends had an animated discussion ranging from plastics to politics, mixed with memories of clam digs and surfing. It got too much to summarize; she simply wrote, “Thank-you.”

And quiet gazes. Individuals stood in front of the whale long moments and spoke no words at all. “Why does this make me want to cry...?” one person asked. Another stood in front of the hands and wondered at the clamorous nature of them. I hadn’t intended them to be that way, I replied. We’re takers, he said, we must change.

As for the artist? She spent days, weeks, in the solitude of her studio, painting a great whale she knew nothing about. As the whale took form, the two of them began a dialogue, spaced out between stretches of silence as they observed one another, curious, thinking about the other’s world. They are not the same after this encounter, of that I am certain.

Evaluating Ocean Perceptions and Ocean Values: The Canadian Ocean Literacy Survey

Lisa (Diz) Glithero, Canadian Ocean Literacy Coalition & David B. Zandvliet, Simon Fraser University

Abstract

This paper describes the development, validation, and key findings of the Canadian Ocean Literacy Survey. Led by the Canadian Ocean Literacy Coalition (COLC) and its research partners, this survey was developed as part of a Canada-wide, mixed methods research initiative examining how ocean literacy is understood and practised across different regions and sectors. The survey included items linked to ocean perceptions, values, and actions as reported by two categories of Canadian respondents: “ocean-engaged” (n = 1,359) and “general public” (n = 1,010). The survey objectives were as follows: to determine if Canadians would identify Canada as an “ocean nation”; to uncover meaningful patterns in ocean awareness, perceptions, and values by region and subgroups; and to better understand Canadians’ emotional connections to, and relationship with, the ocean, as well as their behavioural intentions and actions.

Résumé

Le présent article décrit la conception, la validation et les principales conclusions du Sondage canadien de la connaissance de l’océan. Mené par la Coalition canadienne de la connaissance de l’océan et ses partenaires de recherche, ce sondage a été mis au point dans le cadre d’une initiative pancanadienne de recherche à méthodes mixtes examinant la compréhension et la pratique de la connaissance de l’océan dans différentes régions et différents secteurs. Le sondage abordait les points suivants : perceptions, valeurs et actions à l’égard de l’océan. Deux groupes ont été sondés : les « répondants sensibilisés » (n = 1 359) et le « grand public » (n = 1 010). Le sondage visait à déterminer si les Canadiens reconnaissaient leur pays comme une « nation océanique » et à dégager des tendances significatives en ce qui concerne la sensibilisation au milieu marin, les perceptions et les valeurs en fonction des différents sous-groupes et régions afin de mieux comprendre le lien émotif et la relation qui unit les Canadiens à l’océan, de même que leurs intentions et leurs actions.

Keywords: ocean literacy, ocean perceptions, ocean values, ocean action, survey design, Canada

Mots-clés : connaissance de l’océan, perceptions à l’égard de l’océan, valeurs à l’égard de l’océan, actions à l’égard de l’océan, conception de sondage, Canada

Introduction and Background

This paper describes the development and validation of an ocean literacy survey by the Canadian Ocean Literacy Coalition (COLC) and its research partners. Widely accepted internationally, ocean literacy is a term that has been defined as one's understanding of "the ocean's influence on us and our influence on the ocean(s)" (National Oceanic and Atmospheric Administration, 2013, p. 1). Using established psychometric principles, the Canadian Ocean Literacy Survey was developed as part of a larger Canada-wide research initiative led by COLC to better understand Canadians' varied relationships with the ocean and, more specifically, to examine how ocean literacy is understood and practised across the country's different regions and sectors. The aim of the national study was to establish the first baseline of ocean literacy in Canada, and in so doing to co-develop an evidence-based national ocean literacy strategy.

Our relationship with the global ocean, or the interconnection of the world's seas, goes beyond the ocean being a simple source of food and resources. Indeed, this enormous mass of water that encircles the globe influences climate, weather, biodiversity, and ecosystems. Globally, there is a deepening understanding of the importance of our interactions with a diversity of marine ecosystems (Selig et al., 2019). There is also growing evidence that human pressures are increasingly putting the health of these ecosystems at risk (Borja et al., 2016) through unsustainable practices (e.g., plastic pollution, overfishing, carbon dioxide emissions) that contribute to ocean acidification, deoxygenation, and changes in water temperatures (International Union for Conservation of Nature, 2017).

The global ocean is an increasingly important component of national socio-economic development strategies (e.g., Canada's emerging Blue Economy Strategy). However, if these development strategies do not prioritize sustainability and equity, the health of marine and coastal ecosystems could be further jeopardized, along with the communities that depend on them. As policy, academic, technological, and on-the-ground community solutions continue to be shared and implemented to mitigate human impacts on these ecosystems, fostering ocean and climate awareness, connections, and stewardship in citizens is likewise an essential step. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2021), changes in the way we think about and understand our relationship with the ocean can be addressed by an increased focus on ocean literacy.

Ocean literacy was introduced more than 15 years ago in the United States and has since grown into a worldwide movement. Momentum has been particularly spurred by collaborative international policies and agreements. For instance, the *Galway Statement on Atlantic Ocean Cooperation* (2013) has contributed to international ocean collaboration in the "North Atlantic Region," which includes the European Union, Canada, and the United States; the *Belém*

Statement on Atlantic Research and Innovation Cooperation (2017) has done the same for the “All-Atlantic Region,” which stretches north–south along the Atlantic Ocean and encourages collaboration across North and South America, Africa, and Europe.

Ocean literacy in its various forms will be key to influencing (or mitigating) our individual and collective actions in Canada and abroad, as well as to helping us understand how we are directly or indirectly connected to diverse marine environments. Central to the global concept of ocean literacy is ensuring that all citizens gain a better understanding of the importance of the ocean, the varieties of human–ocean interactions, and the opportunities to act sustainably to reduce human impacts on marine systems (Santoro et al., 2017).

Describing and evaluating ocean literacy, then, is an important challenge for all parts of society, including educators, trainers, students, young professionals, civil society, scientists, consumers, industry, and policy makers (Uyarra and Borja, 2016). Developing descriptors and measures for ocean literacy can be seen as an essential part of the strategies needed to change human behaviours and practices, while also creating opportunities for sustainable development (Gelcich et al., 2014). Ocean literacy has been identified as one of the seven societal outcomes for the current United Nations Decade of Ocean Science for Sustainable Development (UN Decade 2021–2030), of which the seventh and final outcome promotes “an inspiring and engaging ocean where society understands and values the ocean” (oceandecade.org). Measuring “societal understanding” and “ocean values” are thus clearly recognized as important indicators of the UN Decade’s overarching objective of “transformational action.”

Consultation and Research Design

The development of COLC’s Consultation and Engagement Phase formally began in late April 2019 with a strategic planning session led by COLC and attended by 12 participants representing diverse regional, sectoral, and cultural perspectives. Together, the participants contributed to the co-establishment of a preliminary research framework. This framework was centred on a robust consultative process at both a national and regional level (September 2019 to March 2020). The research outcomes were published in June 2020 as a series of reports in the *Understanding Ocean Literacy in Canada* study. The study’s evidence-based findings directly informed the eventual launch of *Land, Water, Ocean, Us: A Canadian Ocean Literacy Strategy* in March 2021.

The Consultation and Engagement Phase of the project was led by COLC’s research team, composed of a national coordinator, five regional coordinators (three post-docs and two graduate students), two research assistants, five artists, and five supporting research professors. Together, the team examined the overarching research goals and scope of the consultations as the foundation of the larger Strategy development process. These early discussions yielded important

outcomes for the conceptualization of the research, including the need to consider broad opportunities and approaches for community engagement, “a spectrum” of best practices, and potential ways to bridge ocean and freshwater literacy efforts. Most importantly, the research needed to ensure, support, and celebrate regional diversity within and across the Canada-wide consultation process.

In our evolving research design, we paid close attention to the complex nature of institutional research as it involved a variety of academic partner institutions (and ethics protocols). Likewise, we closely observed different provincial/territorial processes for the approval of community engaged research. In addition, protocol and care related to the sensitivity and protection of Indigenous knowledge (e.g., as outlined by the First Nations Information Governance Centre and in the National Inuit Strategy on Research) were important considerations for COLC’s research team. Finally, as a pan-Canadian research team, it was paramount that our approach facilitate people coming together to co-create, co-explore, co-develop, and co-identify the salient aspects of ocean literacy in distinctly Canadian contexts.

We used a mixed methods research framework, including a national survey, semi-structured interviews, online organizational asset mapping surveys, document scans, targeted workshops (i.e., youth), and arts-based methods. This article focuses on the instrumental design and resultant key findings of the national survey only.

National Survey Design

Initial conceptions of the national survey included items linked to ocean values, perceptions, and attitudes related to ocean-connectedness as held by two categories of respondents (all 15 years of age or older): self-identified “ocean-engaged” Canadians (either directly or indirectly engaged in ocean literacy or ocean-related work) and the “general public.” We intended to broadly survey Canadians with a short and efficient tool which, at a minimum, would establish the following: how strongly individuals identified as being part of an “ocean nation”; how relevant the ocean is to a citizen’s daily life; and to what extent Canadians could identify, rank, or categorize ocean concerns and actions. We hoped to define a series of constructs that would help to further elucidate our Canadian conceptions of ocean literacy and pair the survey with a mixed methods approach linked to other qualitative methods that could “tell the story” of ocean literacy in Canada.

Briefly, the topics intended for the survey included:

- knowledge about current ocean threats and conservation policies and practices
- awareness of and attitudes toward ocean conservation and the blue economy
- values pertaining to ocean ecosystems and marine ecological services

- perceptions of ocean health and the role citizens play in ocean stewardship
- citizens' behavioural intentions pertaining to ocean sustainability

Specifically, the survey objectives were threefold:

- to determine the extent to which Canadians surveyed would identify Canada as an “ocean nation”
- to uncover response patterns that exist by region and subgroups in order to better understand ocean awareness, perceptions, and values, across Canada, and among its various regions and communities.
- to better understand Canadians' emotional connections to and relationship with the ocean, as well as their behavioural intentions and actions

Survey Instrument Development

Our conceptual framework for the measurement and evaluation of ocean perceptions (and of survey methodology generally) is rooted in the work of early scholars such as Kurt Lewin and Henry Murray (Fraser, 1998). Decades ago, Lewin's (1951) field theory stipulated the key idea for all psychosocial research that followed, namely, that human behaviour has two determinants: 1) the environment and 2) the environment's interaction with an individual's personal characteristics. To illustrate this concept, Lewin (1951) communicated his field theory in which human behaviour is conceived as a function of both a person and their environment. Over the ensuing decades, a wide range of social science research instruments have been constructed, tested, and validated to describe these personal and perceptual elements as they relate broadly to human experience.

Social scientists characterize the development of survey methodology in phases (Creswell & Plano Clark, 2007). In the first phase, the main foci of psychometric research involved establishing reliable and valid instruments for mapping perceptual dimensions as they linked to attitudes, learning outcomes, and other aspects related to human experience. This could include examining links between perceptual measures and learning outcomes, or identifying differences in perceptions across genders, ages, or ethnicities. Much of this research was descriptive or correlational in nature.

A second phase (2000 to the present) includes broader methodologies in which more varied research questions are investigated (Zandvliet and Fraser, 2018). This development has led to greater diversity in research methods and to the inclusion of a range of mixed methods that incorporate both quantitative and qualitative data collection into an integrated research design.

Because learning is not viewed as an individualized phenomenon by social scientists, survey research methods continually stress that learning occurs within and under the powerful influence of strong social factors (Fraser, 2014). Importantly, perceptual studies conducted during the past few decades have

diversified to involve the use of qualitative methods in describing these factors, and in the triangulation of qualitative and quantitative data sets (Tobin & Fraser, 1998). Today, survey methodology has diversified as a variety of approaches, and instruments have been developed, tested, and validated in a range of settings (Fraser, 1998; 2014).

For this study, a key consideration in designing perceptual measures as part of our conception of ocean literacy lay in the latent potential of these measures to be predictive of other outcomes, such as attitudes or behaviours related to the ocean. This, in turn, underscored the need to develop a variety of methods to measure, map, or typify various data sets related to perceptions of marine environments. To this end, we referred to contemporary mixed methods research practices, which combine a variety of information and data sources in their design. Perhaps most importantly, mixed methods can give a voice to diverse demographics, such as age, gender, or ethnicity, regardless of the disciplinary context or knowledge (Zandvliet & Fraser, 2018). Put simply, our perceptions about our experiences are invaluable resources for understanding the complexity of what we will define as “ocean literacy” now and in the future. In the context of this study, our survey methods were complemented by observation, interviews, and other rich sources of qualitative data.

Recent Surveys Related to Ocean Literacy

Recent polling by the World Wildlife Foundation (WWF, 2016; Environics Research, 2019) has primarily focused on public opinion regarding marine protected areas in Canada. The most recent study (Environics Research, 2019) included 22 questions administered to 1,665 respondents (aged 18 years old and over). The constructs measured included Canadians’ values placed on the ocean and perceptions of and support for ocean solutions (e.g., protecting oceans and their ecosystems, including wildlife habitats; reducing use of toxic chemicals). Their report presented compelling evidence that these views have been widely held over time, which was especially evident when comparing the 2016 and 2019 survey results. For the most recent study, a mixed methods approach was used: 1,515 interviews were conducted with an online panel in the Canadian provinces, and 150 interviews were conducted by telephone in the Canadian territories. Quotas for the study were set by region, age, and gender, as well as household income (in the provinces) and Indigenous identity (in the territories). Data were weighted to ensure the final sample was representative of the Canadian population, according to the most recent Census (2016) census data.

Similarly, the International Ocean Literacy (IOL) Survey (Fauville et al., 2019) aimed to serve as a community-based measurement tool allowing the comparison of levels of ocean knowledge among 15- to 17-year-olds over time and across location. The tool was first developed in English and within

a concentrated American and European context. The IOL Survey has faced a number of criticisms, including the following: it is too narrow in its focus (McKinley & Burdon, 2020); it uses only knowledge outcomes as measures; and it only administers multiple choice questions on knowledge ideas that are directly linked to the American-generated Ocean Literacy Principles and Fundamental Concepts specific to the U.S. national science K–12 curriculum (see Cava et al., 2005).

Despite its potential shortcomings, the IOL Survey has been subjected to two rounds of field testing. For the most recent study, data were collected in early 2019 from participants aged 15 to 17 years old with a total of 7,900 respondents across 14 languages: Catalan, Dutch, English, Greek, Italian, Japanese, Korean, Polish, Portuguese, Simplified Chinese, Spanish, Tagalog, Thai, and Traditional Chinese (Chen et al., 2020). Overall, the items in the survey’s single “ocean literacy” scale demonstrated high internal consistency, though the scale was unidimensional in that it measured only one latent trait: knowledge outcomes related to a somewhat limited conception of ocean literacy.

Most recently, the Seas, Oceans and Public Health in Europe project (SOPHIE) developed a large-scale, European survey on oceans and human health. This survey was developed with the aim of understanding public perceptions of both the risks and benefits to marine ecosystems for human health and well-being. Their study surveyed the opinions expressed by 14,167 European citizens from 14 countries about their interactions with marine environments and their perceptions of a range of marine activities (SOPHIE Consortium, 2020). These opinions were solicited in relation to a variety of factors, including public health and well-being, health of the marine environment and economy, and overall concerns and priorities related to the marine environment. Data were collected using representative online panels for each country.

This sampling of current ocean literacy survey research helped COLC’s research team conceptualize factors to include in the developing the Canadian Ocean Literacy Survey.

Survey Methods

A targeted review conducted by the COLC research team uncovered relatively little empirical research on the measurement of ocean literacy within the Canadian context and noted few studies using validated surveys to measure ocean related factors. This finding drove our need to design and validate our own survey instrument for use in this research. The Canadian Ocean Literacy Survey was designed to gauge factors of interest for all Canadians about *ocean perceptions* and *ocean values* pertaining to a range of issues. As we worked to develop the survey structure, we considered individual items and factors (groups of related items) from published surveys, including those of ocean knowledge, attitudes, values, perceptions, and behavioural intentions.

Referencing normative practices for survey design, the administered structure for the survey eventually included 10 perceptual items to which respondents were asked to respond using a five-point Likert scale (5-strongly agree, 4-agree, 3-neutral, 2-disagree, or 1-strongly disagree). These items were grouped into two potential factors (ocean perceptions and ocean values), which were then augmented by additional items that allowed respondents to check off a range of responses related to their ocean knowledge, attitudes, or intended behaviours. At the end of the survey, participants were given a final text option to respond in an open-ended way by telling an “ocean story.”

A finalized version of the Canadian Ocean Literacy Survey, in both English and French, was made available to the general public and was administered using a web-based platform. Links to the survey were distributed through the COLC network and members’ extended networks to professional communities, most of whom were directly or indirectly engaged in ocean literacy or broader ocean-related work. We referred to this group as “ocean-engaged.” In addition, Nanos Research administered a shortened version of the same survey to poll a random sampling of the Canadian public. We referred to this group as the “general public.”

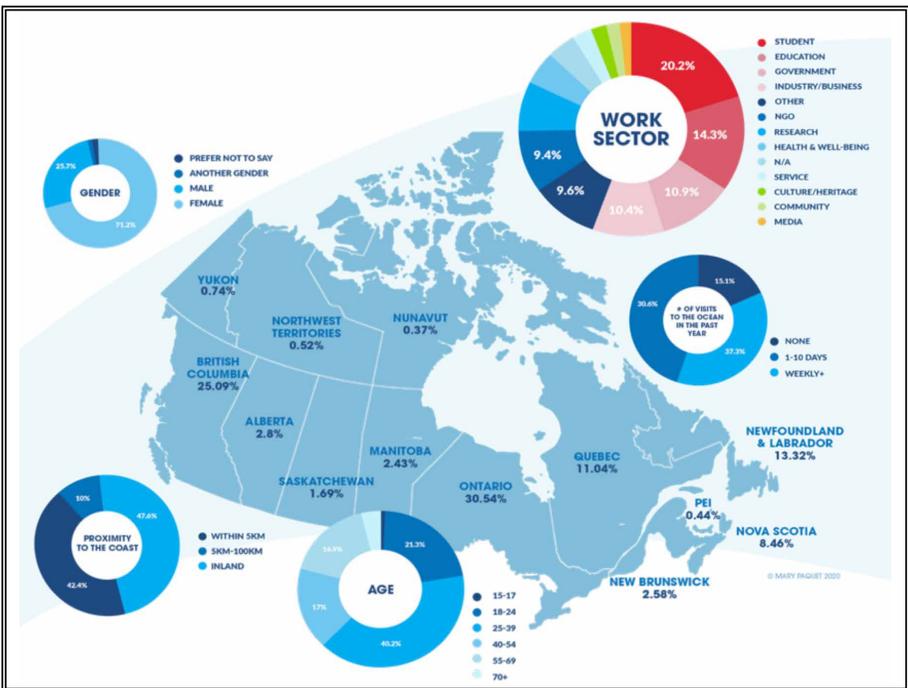


Figure 1. Demographic Breakdown of the Ocean-Engaged Survey Respondents (n = 1,359). Graphic Design: Mary Paquet

Study Sample

The “ocean-engaged” sample for this study consisted of 1,359 Canadians (15 years of age or older) responding to the online survey between September 23, 2019 and January 31, 2020. For this sample, a broad geographical distribution was reached, with the largest response clusters concentrated in Ontario and British Columbia, followed by Newfoundland and Quebec. Figure 1 highlights the demographic breakdown of the ocean-engaged survey respondents. Of the total sample (n = 1359), there was an 89.2% overall completion rate of the items, although the response rates varied for each item. In summary, 25 of 26 questions administered were Likert response scale or checkbox. The final question consisted of an open-ended (and optional) comment with a completion rate of 25.2% .

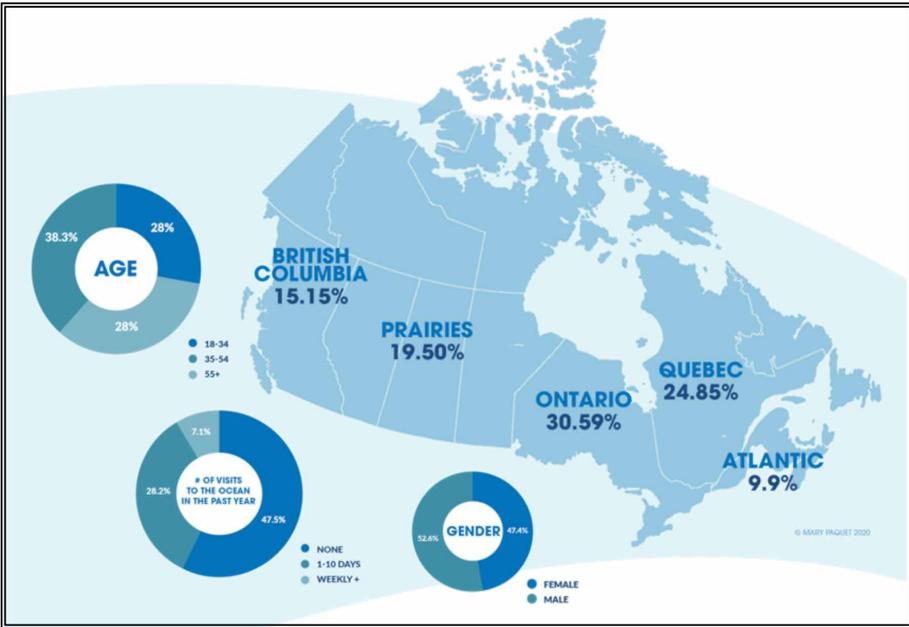


Figure 2. *Demographic Breakdown of the “General Public” Survey Respondents (n = 1,010). Graphic Design: Mary Paquet*

For the “general public” sample, 1,010 Canadians were polled. For this group, the survey items were included as part of a larger omnibus survey being conducted by Nanos Research. In its administration, fewer questions were asked and fewer demographic data were gathered. For example, we were unable to collect data on respondents’ proximity to the coast, work/sector breakdown, or ethnic identity. The study participants (aged 18 years or older) participated in a hybrid telephone and online random survey conducted by Nanos Research

between November 29 and December 2, 2019. Figure 2 highlights the demographic breakdown of the “general public” survey respondents.

Validation of Survey Data

The survey instrument developed for use in this study was one that intended to gauge factors of Canadians’ *ocean perceptions* and *ocean values* as few recent studies have included validated surveys to measure these factors in the Canadian context. The survey proved to be a reliable and valid tool for measuring these constructs for the two population groups sampled. As the items are not time or age sensitive, the questionnaire was easily adapted for use with both the “ocean-engaged” and “general public” respondents.

As noted in Table 1, two scales (*ocean perceptions* and *ocean values*) were incorporated as “perceptual” measures into the survey, and the items for each were developed from two sources: 1) previously referenced inventories and 2) data emerging from focus groups with collaborators and the COLC research team. For each of these factors, items were responded to using a five-point Likert scale (ranging from strongly agree to strongly disagree), and the validity and reliability data were independently calculated for each factor for each of the samples.

Scale	Sample Item
Ocean Perceptions	My day-to-day actions impact the ocean.
	The ocean directly influences my day-to-day activities.
Ocean Values	Ocean health is important to me.
	I am willing to make changes to support ocean health.

Table 1. Sample Items from Scales Included in the Canadian Ocean Literacy Survey

Scale	Reliability/ Validity Data	Ocean-Engaged Sample	General Public
Ocean Perceptions	Cronbach <i>alpha</i>	.72	.63
	<i>Discriminant validity</i>	.32	.38
Ocean Values	Cronbach <i>alpha</i>	.73	.66
	<i>Discriminant validity</i>	.32	.38

Table 2. Validity and Reliability Data for Scales from the Canadian Ocean Literacy Survey

The calculated values from the Cronbach *alpha* and *discriminant validity* values for administration of the survey to the “ocean-engaged” and “general public” samples indicate that the measured constructs (*ocean perceptions* and *ocean values*) demonstrate acceptable (within scale) reliabilities and discriminant validity among the other measures on the survey. This demonstrates that these scales are robust and can be used in a variety of contexts (e.g., for educators and/or the general public) wishing to measure, evaluate, or describe these factors as important components of ocean literacy.

Survey Results

Items on the survey yielded rich information about how Canadians view their relationship with the ocean environment. Survey data demonstrated that Canadians strongly identify as an ocean nation and that they are willing to make lifestyle changes to support ocean health. Canadians also indicated that they want Canada to be an international leader in ocean protection. However, Canadians differed on a number of measures, including what actions they take to protect the ocean, what they value most about the ocean, and to what extent they perceive the ocean as influencing their day-to-day lives. These results indicate that there remains a significant gap in the participants’ relational understanding of their personal, day-to-day impacts on the ocean and the ocean’s impact on their daily activities. These ideas are key to our conception of ocean literacy.

Figure 3 presents the findings specific to the ocean perceptions and ocean values statements for both sample populations (i.e., “ocean-engaged” and “general public”). Some findings of particular interest:

- 82% of the “general public” identify that they would like Canada to be an international leader in ocean protection, which is a similar finding to the “ocean-engaged” sample. However, when asked “What do you value, if anything about the ocean on Canada’s coasts?” the response rates were low as compared to the “ocean-engaged” sample (life-sustaining: 94.9% vs. 37.4%; aesthetics and scenery: 72.4% vs. 15.9%; health and well-being: 71.2% vs. N/A). Findings for both data sets, however, were relatively similar across age groups, gender, geographical regions, and proximity to the coast.
- Respondents identified strongly with the idea that the ocean plays an important role in the Canadian economy but less strongly that the ocean directly influences their day-to-day activities.
- 77% of the “general public” identified that they are willing to make lifestyle changes to support ocean health.

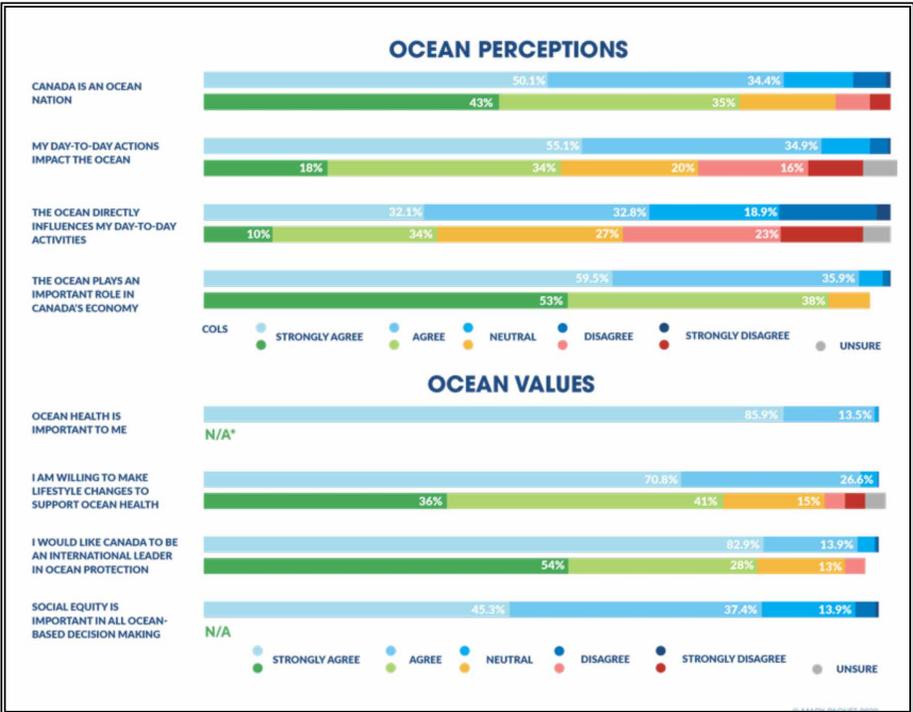


Figure 3. Illustrated Findings of the Ocean Perception and Ocean Values Statements for Combined Sample Populations (i.e., “Ocean-Engaged” and “General Public”). Graphic Design: Mary Paquet

Overall, Canadians shared that they learn most about the ocean through popular media, including print, television, radio, Internet, etc. The survey data indicated that the measures of ocean perceptions and ocean values were fairly homogeneous across age groups, gender, and geographical regions (including frequency of visits to, and proximity to, the coast). With media clearly identified as the most important way that Canadians learn about the ocean, there is a need to better leverage and engage with the media for sharing knowledge and stories that highlight the continuing relationship between people and the ocean.

Discussion

The results of the Canadian Ocean Literacy Survey speak to and describe several issues specific to ocean concerns in Canada. Although 44.1 % of the general public identified ocean pollution as an ocean threat of concern (60.5 %

amongst the “ocean-engaged”), linkages between climate change and the ocean (i.e., ocean warming, ocean acidification, rising water levels, storms) ranked extremely low with this group (9.5%) as compared to the “ocean-engaged” sample (77.4%). This suggests that greater efforts are needed to communicate the intersectionality of climate change with broader ocean literacy concepts.

The survey results also speak to the different types of ocean actions that Canadians must take. Along with better understanding Canadians’ ocean perceptions and ocean values, the broader research goals aimed to learn about behavioural intentions with respect to taking individual and collective action to support ocean health. Overall, more than three quarters of Canadians (77%) agreed that they are willing to make lifestyle changes to support ocean health. Similarly, more than three quarters of the “ocean-engaged” sample (77.4%) identified “engaging in ocean action(s)” as “very important,” ranking this action higher than “cultivating ocean values” (72.6%) and “mobilizing ocean knowledge” (70.6%). This finding is of particular interest when examining ocean literacy (in Canadian contexts), as is referenced by our framework: ocean knowledge, ocean values, and ocean action. The results clearly demonstrate that ocean knowledge alone is not sufficient to enact change. Action (or actionable knowledge) is critical and is also potentially influenced by measures such as ocean values and/or ocean perceptions.

In the context of collective actions then, the “ocean-engaged” sample of the survey clearly ranked five actions (among the listed items) as top priorities: reducing ocean pollution (e.g., banning plastic usage); reducing carbon emissions; supporting a just transition to sustainable economies; increasing public awareness and education; and creating marine protected areas. With respect to individual actions, the “ocean-engaged” sample, once again, clearly ranked five actions as the top priorities, several of which overlapped with the top “collective actions” required: reducing personal waste (e.g., cutting back on use of plastics); raising awareness and teaching others; changing buying habits; taking political action; and reducing carbon emissions.

Finally, in terms of what agencies Canadians look to for ocean protection leadership, the top five were ranked as follows: federal government (67.8%); provincial/territorial governments (44.7%); environmental and conservation organizations (38.6%); industry (31.7%); and First Nations, Métis, and Inuit governments, organizations, and communities (25.3%). Figure 4 illustrates a summary of other insights specific to ocean actions.

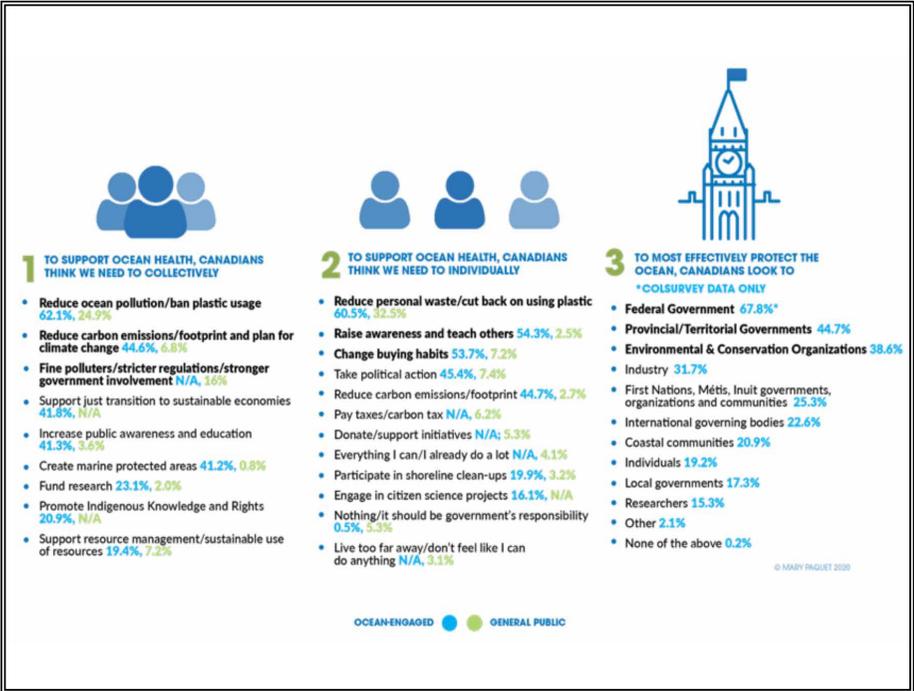


Figure 4. Canadians’ Perceptions on Individual and Collective Ocean Action Priorities As Well As Ocean Protection Leadership. Graphic Design: Mary Paquet

Limitations

This study notes a few limitations in ranking the results specific to which ocean threats Canadians are most concerned about. For example, in the survey (administered to the “ocean-engaged” sample), responses appeared as three separate items: ocean warming, ocean acidification, and coastal hazards (e.g., sea level rise, storms). However, in the Nanos Research poll administered to the general public, these items appeared as one response option—climate change/ rising water levels—and the results represent a combined total of these options. Similarly, ocean pollution appeared in the survey as one response option that included sewage, garbage, and plastic. In the Nanos poll, however, these items appeared as two separate responses: ocean pollution from sewage, garbage; and plastic. Therefore, it is difficult to make comparisons on these measures across the two samples.

Conclusion

The development and validation of the Canadian Ocean Literacy Survey demonstrates that the scales of “ocean perceptions” and “ocean values” are valid and reliable factors in our developing conception of ocean literacy. This finding is consistent in both “ocean engaged” and “general public” populations across Canada. Thus, these factors should be considered as robust items for inclusion in future research in this area. The survey was administered as part of a Canada-wide, mixed methods study examining how ocean literacy is understood and practised across different regions and sectors. It included items to better describe our emotional connection to, and relationship with, the ocean—broadly conceived.

As we look to measuring ocean literacy progress in Canada over the course of the UN Decade (2021–2030), the evidence-based understanding gained from the Canadian Ocean Literacy Survey provides a useful baseline upon which to build capacity in this area. Moving forward, a multi-year mixed methods evaluative framework that includes creative engagement (e.g., community story mapping, arts-based interactions), as utilized in the broader *Understanding Ocean Literacy in Canada* study, will be required. In order to track changes or trends across regions and with a culturally diverse citizenry, surveys can be a useful tool in measuring efficacy or in comparing among different possibilities or strategies for impacting Canadians’ level of ocean literacy over time.

We also recognize that knowledge exchange and evaluative design collaboration with international ocean literacy colleagues is essential to enhancing our work in Canada. This too, is an integral component of the shared global commitments that have been made to ensure that the societal outcomes of the UN Decade are achieved. Currently, these outcomes are aspirational, requiring collective thought leadership with regard to how the global “we” will track and measure “societal understanding and values of the ocean” over the decade, and beyond.

How do we turn aspirational goals into measurable outcomes? How will we know that our objectives for ocean literacy are progressing? And how will these potential successes be shared globally? These are but a few of the questions the COLC research team is now considering and which we will tackle together with our national and international colleagues. These efforts are already beginning; for example, recent work in the United Kingdom (McKinley & Burdon, 2020) is providing a new synthesis of evidence for potential measurement frameworks and evaluative design thinking that is specific to measuring ocean literacy. This and other emerging research (Ashley et al., 2019) will be useful starting points for realizing our collective goal of transforming ocean-climate knowledge into changes in the behaviours and actions that will promote ocean sustainability. Using an evidence-based approach to measuring and describing these factors will be a key part of the future of ocean literacy research.

Acknowledgements

We would like to recognize the contributions of all members of the COLC research team that supported in the design of the survey tool, including Julia Ostertag, Carie Hoover, Lilia Yumagulova, Sarah MacNeil, and Justine Ammendolia. We would also like to thank Mary Paquet for her graphic design contributions. This research was approved by Dalhousie University Research Ethics Board, REB #: 2019-4891

References

- Ashley, M., Pahl, S., Glegg, G., & Fletcher, S. (2019). A Change of Mind: Applying Social and Behavioural Research Methods to the Assessment of the Effectiveness of Ocean Literacy Initiatives. *Frontiers in Marine Science*. DOI: 10.3389/fmars.2019.00288
- Belém Statement on Atlantic Research and Innovation Cooperation. (2017). Retrieved from https://www.oceanoazulfoundation.org/wp-content/uploads/2017/07/belem_statement_2017_pt.pdf
- Borja, A., Elliott, M., Andersen, J. H., Berg, T., Carstensen, J., Halpern, A.-S., Korpinen, S., Stewart Lowndes, J., Martin, G., & Rodriguez-Expeleta, N. (2016). Overview of integrative assessment of marine systems: The Ecosystem Approach in practice. *Frontiers in Marine Science*. 3:20. doi: 10.3389/fmars.2016.00020
- Cava, F., Schoedinger, S., Strang, C., & Tuddenham, P. (2005). *Science content and standards for Ocean Literacy: A Report on ocean literacy*. From <http://www.cosee.net/files/coseecal/OLit04-05FinalReport.pdf>
- Chen, Y.-F., Cannady, M. A., Fauville, G., & Strang, C. (2020). *Working toward an international assessment of ocean literacy: Validating instrument with Rasch measurement model*. American Educational Research Association (AERA) annual meeting, San Francisco, CA.
- Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage.
- EnvironicsResearch. (May, 2019). *Public Opinion on Marine Protected Areas*. Retrieved from: <https://ml.globenewswire.com/Resource/Download/c815d81d-3f37-48af-860e-030fd1548ee4>
- Fauville, G., Strang, C., Cannady, M.A & Chen, Y. (2019) Development of the International Ocean Literacy Survey: measuring knowledge across the world., *Environmental Education Research*, 25:2, 238-263, DOI: 10.1080/13504622.2018.1440381
- Fraser, B. J. (1998). Science learning environments: Assessment, effects and determinants. In B. J. Fraser and K.G. Tobin (Eds.), *International handbook of science education* (pp. 527-564). Dordrecht, Netherlands: Kluwer.
- Fraser, B. J. (2014). Learning environments: Historical and contemporary perspectives. In N. Lederman & S. Abell (Eds.), *Handbook of research on science education, Volume II* (pp. 104-119). New York: Routledge.
- Galway Statement on Atlantic Ocean Cooperation. (2013). Retrieved from <https://atlanticresource.org/aora/sites/default/files/GalleryFiles/Default/GalwayStatement.pdf>

- Gelcich, S., Buckley, P., Pinnegar, J. K., Chilvers, J., Lorenzoni, I., Terry, G., et al. (2014). *Public awareness, concerns, and priorities about anthropogenic impacts on marine environments*. Proc. Natl. Acad. Sci. U.S.A. 111, 15042–15047. doi: 10.1073/pnas.1417344111
- International Union for Conservation of Nature (IUCN). (November, 2017). *The Ocean and Climate Change*. Retrieved from <https://www.iucn.org/resources/issues-briefs/ocean-and-climate-change>
- Lewin, K. (1951). *Field theory in social science: Selected theoretical papers* (D. Cartwright, Ed.). New York: Harper & Row.
- McKinley, E. & Burdon, D. (2020). *Understanding Ocean Literacy and Ocean Climate-related Behaviour Change in the U.K. – Work Package 1: Evidence Synthesis*. Technical report produced for Ocean Conservation Trust & Defra. Retrieved from: <https://oceanconservationtrust.org/ocean-literacy-evidence-review-understanding-ocean-literacy-and-ocean-climate-related-behavior-change-in-the-uk/>
- National Oceanic and Atmospheric Administration. (2013). *Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages* (Version 2). First published June 2005, revised March 2013. Retrieved from: <https://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf>
- Santoro, F., Santin, S., Scowcroft, G., Fauville, G., and Tuddenham, P. (2017). *Ocean Literacy for All - A Toolkit*. IOC/UNESCO & UNESCO Venice office Paris (IOC Manuals and Guides, 80 revised in 2018), 136.
- Selig, E. R., Hole, D. G., Allison, E. H., Arkema, K. K., McKinnon, M. C., Chu, J., et al. (2019). Mapping global human dependence on marine ecosystems. *Conservation Letters*, 12(2): e12617. doi: 10.1111/conl.12617
- SOPHIE Consortium. (2020). *Citizens and the Sea. Public perceptions of Oceans and Human Health: A 14-country pan-European citizen survey*. H2020 SOPHIE Project. Ostend, Belgium.
- Tobin, K., & Fraser, B. J. (1998). Qualitative and quantitative landscapes of learning environments. In B. J. Fraser & K. G. Tobin (Eds.), *International handbook of science education* (pp. 623–640). Dordrecht, The Netherlands: Kluwer.
- Uyarra, M. C., and Borja, Á. (2016). Ocean literacy: a ‘new’ socio-ecological concept for a sustainable use of the seas. *Mar. Pollut. Bull.* 104, 1–2. doi: 10.1016/j.marpolbul.2016.02.060
- United Nations Education, Scientific and Cultural Organization (UNESCO). (January, 2021). United Nations Decade of Ocean Science for Sustainable Development. Retrieved from <https://www.oceandecade.org/>
- World Wildlife Fund Canada (WWF). (October, 2016). *Public Opinion on Marine Protected Areas*. Retrieved from http://awsassets.wwf.ca/downloads/wwf_environics_report_mar26.pdf?_ga=2.68735316.451442461.1496678703-306732889.1491409766
- Zandvliet, D. B. & Fraser, B. J. (2018). (Eds.) (2018, Oct.). *Thirty Years of Learning Environments: Looking back and looking forward*. Rotterdam: Brill/Sense.

Coming to Terms with Ocean Literacy

Sarah MacNeil, Canadian Ocean Literacy Coalition, University of Ottawa; Carie Hoover, Canadian Ocean Literacy Coalition, Trent University; Julia Ostertag, Canadian Ocean Literacy Coalition, Dalhousie University; Lilia Yumagulova, Canadian Ocean Literacy Coalition, Simon Fraser University & Lisa [Diz] Glithero, Canadian Ocean Literacy Coalition, Dalhousie University

Abstract

The term “ocean literacy” originated in the early 2000s from American ocean science researchers and educators to strengthen ocean science education in the national curriculum. Worldwide, it has been adapted to reflect a more multidisciplinary approach to understanding humans’ relationships with the ocean. Research from the Understanding Ocean Literacy in Canada national study (2019-2020) (Ammendolia et al., 2020; Glithero, 2020; Hoover, 2020; MacNeil, 2020; Ostertag & Ammendolia, 2020; Yumagulova, 2020) identified ocean literacy as a limiting term, unable to capture the scope of Canadian experiences with the ocean continuum (land, freshwater, coastal areas, sea ice, open ocean), and inadequate in encapsulating different worldviews and across different linguistic communities. We discuss the challenges of contextualizing an international term within Canada and present ideas to move toward more inclusive terminology, examining the challenges still ahead in developing relevant terminology and bridging with international initiatives.

Résumé

Le terme « connaissance de l’océan » (ocean literacy en anglais) a été utilisé pour la première fois au début des années 2000 dans le programme scolaire américain, par des chercheurs et des éducateurs du domaine des sciences marines. Il a ensuite été adapté à l’international pour rendre compte d’une approche multidisciplinaire de la compréhension des relations entre les humains et l’océan. Selon les recherches menées dans le cadre de l’étude nationale Comprendre la connaissance de l’océan au Canada (2019-2020) (Ammendolia et al., 2020; Glithero, 2020; Hoover, 2020; MacNeil, 2020; Ostertag et Ammendolia, 2020; Yumagulova, 2020), le terme « connaissance de l’océan » est restreint et incapable de rendre toute la portée de l’expérience canadienne du continuum océanique (qui comprend la terre, l’eau douce, les régions côtières, la glace de mer, la haute mer); il n’intègre pas non plus l’essence des différentes visions du monde et communautés linguistiques. Nous abordons donc la difficulté d’adapter un terme international à la réalité canadienne et présentons des idées de termes inclusifs tout en examinant les défis qui restent à venir pour trouver une terminologie pertinente et faire le pont avec les initiatives internationales.

Keywords: ocean literacy, ocean continuum, terminology, translation challenges, connaissance de l’océan, French, Inuktitut

Mots-clés : connaissance de l’océan, ocean literacy, continuum océanique, terminologie, problèmes de traduction, l’océan, français, inuktitut

Coming to Terms with Ocean Literacy

In preparation for the launch of the United Nations Decade of Ocean Science for Sustainable Development (2021–2030), the Canadian Ocean Literacy Coalition (COLC) undertook an ambitious year-long study of ocean literacy across five regions (Pacific, Inuit Nunangat, Atlantic, St. Lawrence/Great Lakes, and Inland Canada) with the goal of creating a national ocean literacy strategy. The concept of ocean literacy that had rippled out from the United States in the early 2000s (Cava et al., 2005) was clearly growing into an international movement across an increasingly broad range of society (Santoro et al., 2017). However, the vast knowledge systems, values, and experiences that shape diverse peoples' relationships with the ocean are as fluid and complex as the ocean itself (Te Punga Somerville, 2017). The widely accepted international definition of ocean literacy is understanding “the ocean’s influence on us and our influence on the ocean” (National Oceanic and Atmospheric Administration, 2013, p. 1); however, in attempting to reach beyond ocean educators, we (the COLC research team) proposed a starting definition of ocean literacy that was broader than international framing and included diverse ocean knowledge systems, ocean values, and ocean actions.

Throughout the course of COLC’s year-long study, participants shared with us a rich tapestry of stories, experiences, and perspectives. While the *Understanding Ocean Literacy in Canada* study (2019–2020) (Ammendolia et al., 2020; Glithero, 2020; Hoover, 2020; MacNeil, 2020; Ostertag & Ammendolia, 2020; Yumagulova, 2020) highlighted exceptional work being undertaken across the country, we also identified that a major roadblock to advancing ocean literacy in Canada was the term itself. When the term ocean literacy was known at all (something that varied by and within regions), it was often found to be narrow and limiting. The Western, science-based, English-language dominant roots of ocean literacy were an additional barrier to creating an inclusive movement that draws on the lived experiences and distinct worldviews and practices of diverse cultural, linguistic, and geographic communities across Canada. The struggle with the term “ocean literacy” itself became a central conversation within the research team and with the hundreds of participants who engaged in the research from diverse regions, cultures, linguistic communities, and sectors (Glithero, 2020). While the *intent* behind the term resonated with participants and clearly galvanized remarkable interest in the project, notable sticking points consistently created tensions in collectively coming to terms with ocean literacy terminology.

In this paper, we reflect on the emerging ocean literacy terminology in the Canadian context by drawing on findings from the *Understanding Ocean Literacy in Canada* regional reports (Ammendolia et al., 2020; Hoover, 2020; MacNeil, 2020; Ostertag & Ammendolia, 2020; Yumagulova, 2020). In particular, we consider a number of challenges with ocean literacy terminology in the Canadian context. To begin, we consider how the “ocean” is in itself both a fluid

word and highly dynamic and complex physical entity, better understood as an “ocean continuum.” Second, we consider whether the concept of “literacy” itself (whether ocean literacy, climate literacy, or environmental literacy) creates barriers to a broad-based, multi-sectoral engagement with ocean literacy. Third, since ocean literacy is a term that reflects Western scientific understandings of and relationships with the ocean and education (primarily formal, school-based education), it is a term that is particularly problematic in Indigenous contexts as it risks perpetuating a settler colonial appropriation of Indigenous knowledges, practices, pedagogies, and relationships with land/water. Finally, we dive into issues of translation and language since ocean literacy is a term that emerges from Anglophone institutions and is now being applied to and translated into different linguistic and cultural contexts.

This article brings together theoretical frameworks from translation studies (Conway, 2012), literacy education (Fransman, 2006), environmental literacy (Stibbe, 2009), and Indigenous studies (Reid et al., 2020) to help us reflect on the tensions that are at play when we uncritically call for “ocean literacy for all” (Santoro et al., 2017). We conclude with considerations for pathways that can help us move through these critiques by continuing to build on the energy and sense of urgency that has driven the ocean literacy movement while still ensuring that we actively listen and respond to more marginalized voices to truly co-create culturally and linguistically relevant ocean literacy across Canada. If we want and need to move toward a more sustainable future, including ocean sustainability, we need to adopt a “more ecological culture and participative worldview” (Sterling, 2009, p. 77).

Reflecting on Language: Our Methodology

As the researchers conducting the *Understanding Ocean Literacy in Canada* study, we utilized mixed-method, multi-regional, and multi-sectoral collaborative research approaches, including literature reviews, interviews, and case studies to identify the scope of ocean literacy in Canada (full research process and results available here: <http://www.colcoalition.ca>). Five regional coordinators, one national coordinator, and two research assistants developed an evidence-based approach to identifying the current state of ocean literacy and the diversity of practitioners across the country. At the national level, a random public national survey (Nanos Poll, 1,010 respondents; see Glithero & Zandvliet, 2020), a national survey of ocean literacy providers (Canadian Ocean Literacy Survey, 1,359 respondents; see Glithero & Zandvliet, 2020), a media and social media scan (1,253 news articles, 77 influential twitter accounts; see Shiffman et al., 2020), and a series of youth focus groups (three university focus groups; see Roy, 2020) were used to inform how ocean literacy is used and perceived nationally. At the regional level, five regional coordinators employed standardized methods of literature reviews (322 documents), organizational-level asset mapping survey (136 respondents and 418 total identified assets), arts-based engagements (five

total), and one-on-one interviews (188 total) published across the five regional reports: Pacific (Yumagulova, 2020), Inuit Nunangat (Hoover, 2020), Inland Canada (Ammendolia et al. 2020), St. Lawrence/Great Lakes (MacNeil, 2020), and Atlantic (Ostertag & Ammendolia, 2020).

Throughout this extensive research, discussions about ocean literacy terminology and language emerged as cross-cutting themes within each regional and national analysis, necessitating a critical reflection on the use of the term and the limitations of using “ocean literacy” at the local, national, and international levels. This critical, reflective methodology, combined with our individual positionalities and blind spots to areas outside our spheres of lived experiences and research domains, impacted our views on the terminology. Despite the diverse experiences and perspectives we bring to our collective understanding of ocean literacy, our understandings remain limited by our dominant worldviews, particularly as settler academics working predominantly within English-language communities and Western knowledge systems.

The Emergence of Ocean Literacy in Canada

Within Canada, the Canadian Network for Ocean Education (CaNOE) is credited as one of the first champions of ocean literacy in English-speaking Canada. This volunteer-based, non-profit organization engages formal and non-formal marine educators in bringing ocean literacy to classrooms and communities across Canada. Through ongoing work, the CaNOE community has co-created a living document in answer to the question, “What is Canadian ocean literacy?” (Stewart, 2019). The document touches on many issues highlighted in this paper, such as Indigenous knowledges as well as ecological, jurisdictional, educational, cultural, spiritual, and emotional considerations (among others). This document also serves to highlight various and distinct knowledge systems, as well as freshwater connections. Like the COLC research team, CaNOE recognizes that Canadians support expanding the term ocean literacy to include more than ocean science knowledge.

While ocean literacy has become the predominant term in Canada over the past few years, other terminology continues to emerge. For example, unique to Newfoundland and Labrador, and in particular, Fogo Island, is the New Ocean Ethic (Shorefast Foundation, 2016), which is rooted in the understanding that “if we are to continue to benefit from our relationship with the sea, we must rethink the way we use its resources and exist responsibly on its shores” (p. 3). The New Ocean Ethic places ocean literacy as one of 10 major initiatives to promote and work toward ocean sustainability on Fogo Island. Nationally and internationally, the terms “ocean education” and “marine education” resonate widely in formal and non-formal educational contexts (Fielding et al., 2019; Guest et al., 2015; Scully, 2018). By way of further example internationally, the work of Emma McKinley and colleagues in marine policy in the United Kingdom centres around the use of the term “marine citizenship” (McKinley et al., 2019;

McKinley & Fletcher, 2010) and the potential implications of an enhanced sense of marine citizenship in the management of the marine environment.

As these English-language examples indicate (continue reading for French-language discussion), ocean literacy terminology in Canada is emerging at a time when ocean-specific terms are beginning to proliferate. This suggests that robust interest and a sense of urgency are increasingly driving commitments to improve human–ocean relationships. As a result, diverse terms are being created to reflect and encapsulate these movements.

In the following sections, we turn to findings from COLC’s *Understanding Ocean Literacy in Canada* study (Ammendolia et al., 2020; Hoover, 2020; MacNeil, 2020; Ostertag & Ammendolia, 2020; Yumagulova, 2020) to consider limitations of ocean literacy terminology. We begin with the word “ocean” itself, recognizing that an “ocean continuum” is a more inclusive term for this vast and dynamic Earth system, and we work toward expanding on the term “literacy” in the future.

Why the Term Ocean?

Roughly seven million people in Canada live in coastal zones (Fisheries and Oceans Canada, 2021, including numerous First Nations and the majority of communities across Inuit Nunangat (Inuit homeland in Canada; Inuit Tapiriit Kanatami [ITK], 2004). What is more, 78% of Canadians recognize Canada as “an ocean nation” (Nanos, 2019). There are innumerable types of interactions and lived experiences tied to the ocean that take place across the country every day. Yet, conversations about ocean literacy primarily occur between academics and ocean literacy providers, resulting in difficulties in understanding its role in and significance to society (Glithero et al., 2020; Kopke et al., 2019). This perception of ocean literacy as an elitist, high-level or “ivory tower” framing was confirmed by our study participants across Canada. The COLC research team conducted 188 interviews (roughly 168 of which were conducted in English) across five regions: Atlantic (Ostertag & Ammendolia, 2020), Inland Canada (Ammendolia et al., 2020), Inuit Nunangat (Hoover, 2020), Pacific (Yumagulova, 2020), and St. Lawrence/Great Lakes (MacNeil, 2020). Across these regions, ocean literacy was found to be the following: limiting, requiring a broader and more inclusive framing; disconnected from Indigenous ways of knowing and ineffective at capturing relationships with the ocean; a new or unfamiliar term; and exclusive of freshwater and land-based efforts that are also ultimately connected to ocean health.

Interviews with participants from Inuit Nunangat, along the St. Lawrence River, and throughout Inland Canada in particular suggested that the term “ocean” itself is a barrier for many since the ocean is a dynamic, interconnected system that includes relationships between land, climate, coasts, sea ice, glaciers, wetlands, lakes, and rivers. Etymologically, the word ocean is derived from the Greek *ōkeanos* and the Latin *oceanus*. These terms refer to the great river or

sea that flows around a single land mass, reflecting historical understandings of the earth's shape (Online Etymology Dictionary, 2021). It was not until the 14th century that individual ocean basins began to be distinguished; however, as Te Punga Somerville (2017) reminds us, oceans do not name themselves, and this Eurocentric etymological lineage erases the many languages that have named the ocean(s) to reflect distinct human relationships with these bodies of water. Lynn Jacobs, Director of Environment Protection with the Kahnawà:ke Environment Protection Office, discusses this limitation: "Why the term ocean? It feels disconnected from our reality. For us everything is interconnected: saltwater, freshwater, all the way down to the smallest stream" (MacNeil, 2020, p. 8). Connections to freshwater, local waterways, and watersheds were prevalent in conversations within Inland Canada and the St. Lawrence Region, as they provided a source of transportation, food, employment, recreation, and spirituality akin to how coastal communities experienced the ocean. It quickly became clear that freshwater and watershed issues were fundamentally a part of what ocean literacy *should* encompass. If all water leads to the ocean, dialogue related to the ocean must include all water that will flow into it.

Within Inuit Nunangat, the ocean mostly exists in a frozen state, used for travel and as a platform for hunting. Sea ice is intimately tied to Inuit culture and the historically nomadic way of life (Inuit Circumpolar Council Canada, 2008). In its frozen state, the ocean serves as an extension of the land, and, as noted in the Inuit Nunangat regional discussions and interviews, the terms "ocean," "ice," and "land" are often used interchangeably. Douglas Esagok, an Inuit hunter from the community of Inuvik, shared the following:

One thing I always tell people about the ocean is how important it is to keep our ocean clean, because everything depends on it. [...] The salts the ocean has for your caribou in the wintertime, they go out on the sea ice and they dig down for ice and they lick the salt from the surface of the ice. Our people are originally from the ocean, and everything—our culture—is what we learn from living in the ocean or on the coast. (As cited in Hoover, 2020, p. 7)

For Inuit and many coastal peoples, these relationships with ocean, land, water, and especially sea ice are increasingly destabilized because of the climate crisis and its uneven impacts on vulnerable communities around the world.

In each of the five regions, recommendations moving forward highlighted a more integrated, holistic approach to understanding the ocean. They included bridging inland and coastal perspectives (Pacific), providing space for dialogue and collaboration between ocean and water experts (Inland Canada), adopting a watershed and/or a systems approach to making the ocean visible and accessible (Atlantic), emphasizing the interconnectedness of waters (St. Lawrence/ Great Lakes), and reframing terminology to include land, water, coasts, and sea ice (Inuit Nunangat). These conversations highlight the need to expand our use of the word "ocean" to include coastal and inland Canadians' connections to the

ocean and honour the diverse ways in which Canadians experience the ocean. The use of “ocean continuum” in Canada has been put forward as an initial first step in building a more inclusive “ocean” community as our definition of the ocean expands to include more geographic and cultural perspectives. This recommendation is also connected to a growing awareness among Canadians of a changing ocean due to climate change, biodiversity loss, and other anthropogenic changes that are resulting in fundamental shifts in human relationships with the very idea of the ocean (Lubchenco & Gaines, 2019).

However, we recognize that putting forth the term “ocean continuum” adds to the already jumbled lexicon of ocean terminology, and in so doing, risks the same limitations and potential liabilities of lingering in a conceptualization that is rooted in language alone. This is a key point that we will return to in the article.

The Baggage of Literacy

In the world of education, literacy is a concept largely used in Anglophone discourses to describe four components: “Literacy as a set of skills, literacy as applied and socially situated, literacy as a learning process, and literacy as text” (Fransman, 2006, p. 3). Often, the term “literacy” is used broadly as a metaphor for any skill or competence, including media literacy, computer literacy, cultural literacy, etc. Most relevant for our discussion is the term “environmental literacy,” considered to be one of the oldest non-textual usages of the concept. Coined by Charles E. Roth in 1968, “environmental literacy is essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems” (Disinger & Roth, 1992, p. 3). Similarly, the term “ecoliteracy” continues to circulate in environmental education discourses. Its definition as “understanding how people and societies relate to each other and natural systems in a sustainable way” (Kwauk, 2020, p. 11) closely parallels that of ocean literacy. Equally, the term “sustainability literacy,” which is often defined as becoming “empowered to read society critically, discovering insights into the unsustainable trajectory that society is on and the social structures that underpin this trajectory... [and] become empowered to engage with those social structures” (Stibbe & Luna, 2009, p. 11), confers a threshold of knowledge and critical action to the term literacy.

In this light, it might seem logical to apply the concept of “literacy” to describe diverse processes that can help people learn about their relationship with the ocean. Desired outcomes of these processes include increasing the stewardship, civic engagement, and justice actions required to minimize human impacts on the ocean, restore ocean health, ensure equitable access to ocean benefits, and increase protection from ocean risks. However, although literacy can be used to describe a wide range of educational contexts, criticisms levelled at the term “have started to perceive literacy as an instrument of power and oppression, legitimating dominant discourses and endangering languages, cultures, and

local knowledge” (Fransman, 2006, p.3). In addition to this critique of literacy as instrumentalist and imperial in low- and middle-income educational contexts and countries, “ecoliteracy is low on the to-do list when basic literacy is still an unmet global goal” (Kwauk, 2020, p. 9). Outside of education researchers and practitioners (and validated by our study participants), the term literacy often conjures an association with school-based reading and writing, which in turn underestimates the out-of-school knowledge that learners bring to their literacy skills and undermines the importance of oral discourse. Although literacy has arguably evolved to be understood in the context of multiple literacies and one’s ability to “participate in society” (UNESCO, n.d., para. 1), it remains a deficit-based term, implying the need to address a gap in society and raising the following questions: Whose literacy? For what purposes? To what end?

From conversations across Canada with interview participants, the research team confirmed a mixed connection to the term “literacy.” Many participants considered the term appropriate and saw a direct correlation with the common understanding of literacies as skills or competencies; for these participants, a high-level term was considered useful in uniting practices that might not otherwise have a common label. Most participants, however, voiced some form of concern about the term “literacy.” Participants in Inland Canada highlighted its negative connotations, including the implied deficit of knowledge as well as the binary opposition with the stigmatizing term “illiteracy.” In Atlantic Canada, Shannon Harding, Director of Programs, Clean Foundation, expressed that “the term ‘literacy’ comes with a lot of baggage,” noting that “we often use ‘ocean knowledge’ or ‘ocean understanding’ whenever we’re working with the public [...]. Ocean literacy is the formal term, it’s the suit that all the other less formal terms fit within” (Ostertag & Ammendolia, 2020, p.8). In the Pacific Region, Joachim Carolsfeld, Executive Director, World Fisheries Trust, commented that “literacy does not express the importance of empathy and emotional connection that we see as key elements of policy decisions and individual behaviour” (Yumagulova, 2020, p.6). Within Inuit Nunangat, 77% of interview participants had never heard the term “ocean literacy” (Hoover, 2020), and many expressed concerns that the term limits one’s connection to and negates cultural interactions with the ocean. These tensions surrounding the term, although ultimately unresolved, were often mitigated by alternative words and phrases that embodied ocean literacy regionally and culturally, as discussed in the section below.

Ocean Literacy in Relation to Indigenous Knowledges

Beyond the limitations of the words “ocean” and “literacy,” the combined term is equally insufficient for encompassing distinct worldviews and lived experiences. The overwhelming international focus on education and formal learning was found to poorly represent the broad perspectives and diversity of knowledge and relationships to the ocean within Canada. The term “ocean literacy” was

most notably found to be misplaced among Indigenous communities, as it was inadequate in capturing different ways of knowing. Stewart (2019) writes that “a vital difference between American, European, and other international versions of ocean literacy is that Canadians are working to responsively value and respect Traditional Indigenous Knowledge and Inuit Qaujimagatuqangit,” though the success of this is only beginning to be reflected in the ocean literacy lexicon.

For example, Hailhzaqv (Heiltsuk) of the central Pacific coast are in the process of developing the *Heiltsuk Ocean Act*, bearing the title *Hailkilaxsi ci slá w áw áxtusa gáyáqla qñts dm̄xsāxv*, or “to respect and take care of our ocean relatives” (West Coast Environmental Law, 2019a, 2019b). Hillistis Pauline Waterfall describes this document as “an integral part of our Gvi’las (traditional laws) and our Heiltsuk Constitution. Th[is] Ocean Act encompasses the principles of respecting and taking care of our living ocean and our marine waa-waaxtoos (family)” (Glithero et al., 2020, p.8). The principle of “our ocean relatives” speaks to a deeper, inherent bond existing between humans and the ocean, shaping lived experiences that have impact beyond being ocean “literate.”

For Inuit, ocean literacy was also found to be insufficient within the frame of Inuit Qaujimagatuqangit (IQ), a term to describe Inuit epistemology, which translates as “that which Inuit have always known” (Karetak et al., 2017). More broadly, ocean literacy was found to be inadequate in expressing the ways people learn through culture and other non-education-based methods. As renowned Inuit leader Mary Simon noted,

over millennia, there has been little need for any formal discussion of “ocean literacy” as Inuit lived, breathed, and ate near or from the ocean and lived in relative harmony with animals and seasons. Inuit language interweaves values and numerous words for elements of the ocean that are based on thousands of years of experience, knowledge, and observations. (Glithero et al., 2020, p.13)

IQ instead directly relates to Inuit understanding of, and relationship with the ocean, which includes ice, land, and coasts, and which encompasses the entire realm of Inuit experience in the world and the values, principles, beliefs, and skills that have evolved as a result of that experience (Karetak et al., 2017).

In the Atlantic Region, Mi’kmaq participants pointed to the practice of *Etuaptmunk* (Two-Eyed Seeing) as shared by Elder Albert Marshall (Institute for Integrative Science and Health, n.d. para. 3; Reid et al., 2020). *Etuaptmunk* expresses how Indigenous, Western, and local knowledge systems can be brought together “to better understand the natural world. [*Etuaptmunk*] governs what Mi’kmaw do and why” (Apoqñmatulti’k, n.d., para. 2). In turn, the concept of *Etuaptmunk* furthers *Netukulimk*, which relates to “the use of the natural bounty provided by the creator for the self-support and well-being of the individual and the community [...] achieving adequate standards of community nutrition and economic well-being without jeopardizing the integrity, diversity, or productivity of our environment” (Unama’ki Institute of Natural Resources,

n.d., para. 1). These concepts and practices acknowledge that there are “reciprocal responsibilities” between those humans and nature who share a given territory.

The current international understanding of ocean literacy centres around seven scientific principles as originally defined in the United States-based framework, “Ocean Literacy: The Essential Principles and Fundamental Concepts of Ocean Sciences for Learners of All Ages” (National Oceanic and Atmospheric Administration, 2013). As noted in the introduction of the framework, this definition fails to account for the vast, diverse, and meaningful contributions that Indigenous perspectives bring to the term ocean literacy. What is more evident is how the international usage of ocean literacy lacks Indigenous embodiments of human relationships with the ocean and the natural world. If Canada is to adopt approaches to ocean literacy that are nationally, regionally, linguistically, and culturally relevant, then Indigenous knowledges, languages, and rights must be at the forefront of these conversations. From our collective perspective, this is to be achieved through “reciprocal responsibilities” as named above, meaning the broader ocean literacy community must ensure that inclusion of Indigenous worldviews is not extractive or tokenistic, but is rather reciprocal and mutually beneficial, first and foremost for Indigenous peoples.

Into Murky Waters: Translating Ocean Literacy

The complexity of human relationships with a changing ocean reveals how understanding ocean literacy in Canada cannot be fully realized through the lens of English alone. In this officially bilingual country, there are nearly eight million Francophones spread across all 13 provinces and territories (Statistics Canada, 2017). In addition, there are roughly 70 living Indigenous languages, and at least 22 other significant language communities (100,000+ speakers) have been identified outside of English, French, and Indigenous languages (Statistics Canada, 2017). These diverse linguistic communities have distinct relationships and associations with the ocean, necessitating culturally and linguistically relevant ocean literacy terminology.

From its inception, COLC has operated as a bilingual English-French organization, reflecting the need, as a national entity, to honour both official language communities in Canada. In French, COLC exists as the *Coalition canadienne de la connaissance de l'océan*. The English and French titles, however, are not entirely equivalent: Each word of the name of the Canadian Ocean Literacy Coalition was chosen with deliberate care and forethought by the founding partners of COLC and based on widely accepted international terminology; *Coalition canadienne de la connaissance de l'océan* is the French translation of this decision in English.

In the process of translation, the task of the translator is to spin words from one language into another, typically with the goal of making text read as though it were never written in another language to begin with. From outside

this field, translation might appear to be an exercise of swapping a word in one language for its direct equivalent in another, following a literal translation approach (Nabokov, 1958/1995). However, what is often more important is the notion of equivalency or finding equivalent *concepts* or *referents* (Vinay & Darbelnet, 1995). In adopting a localized approach to translation, in which the translation is rooted in the conceptual realities of the target audience (the destined readers), the reader does not feel displaced or as though they are reading a foreign text. Localization includes translation and other factors, such as interpretation, cultural references, idioms, and local linguistic issues, requiring translators to serve as “cultural interpreters” (Katan, 2014). Without this cultural mediation, many conversations and nuances are missed and text is replaced rather than co-created (Conway 2012). Even more challenging is translating a term that does not already exist in a target language (the language being translated into) or benefit from a robust body of resources and examples of usage. This asymmetrical prevalence of translation from English into more “peripheral” (Conway, 2012) languages accentuates the power imbalances between sociolinguistic communities as well as the decline of linguistic diversity globally (‘Utoikamanu, n.d.). Such is the case of ocean literacy in French, Indigenous, and other languages (addressed in next section).

While COLC in English benefited from discussion, deliberation, and internationally recognized terminology, the *Coalition canadienne de la connaissance de l’océan* was chosen as the best equivalent by the translator, or translation team, at the time of COLC’s launch in 2018. *Connaissance de l’océan* was the term carried into COLC’s broader consultation and engagement efforts in 2019 and used throughout the data collection in the *Understanding Ocean Literacy in Canada* study. However, in what is an otherwise slim repertoire of ocean literacy resources in French, there are at least two other versions of the term in use, including *alphabétisation des océans*, as seen in the Intergovernmental Oceanographic Commission of UNESCO’s Ocean Literacy Portal (<https://oceanliteracy.unesco.org/>), and *littératie océanique*, as appears on the Ocean School platform that was developed by the National Film Board and Dalhousie University (<https://oceanschool.nfb.ca/>). In UNESCO’s French version of the *Ocean Literacy for All: A Toolkit*, *connaissance des océans* and *littératie océanique* are used interchangeably.

Of the 20 French interviews (of 188 total), all conducted within the St. Lawrence and Atlantic Regions, few interview participants were familiar with either ocean literacy or *connaissance de l’océan*, and none of these respondents indicated using the term within the context of their work. Neither term garnered strong opposition, but nor was there any strong interest. It was, however, noted that *connaissance* is much less emotionally charged than “literacy” and overwhelmingly associated with scientific knowledge. In the St. Lawrence Region, a holistic approach was preferred, one that recognizes an ecosystem continuum rather than an ocean-specific expression. This could arguably be

attributed to the prominence of the St. Lawrence River as a freshwater system that flows into a saltwater estuary before opening into the Gulf of St. Lawrence and draining into the Atlantic. In fact, in French, there are two words for river: *rivière* for an inland waterway and *fleuve* for the waterways that connect directly to an ocean basin. In understanding that it is, *bel et bien*, the *fleuve Saint-Laurent* (and not *rivière!*), it is perhaps no wonder that an ecosystem literacy is closer to communicating “ocean literacy” related work in this dynamic region.

While these findings begin to uncover how to unite ocean literacy work in Canada across official languages, they do not yet point to any satisfying conclusion in the search for “ocean literacy” in French. Throughout the process of co-developing the Canadian Ocean Literacy Strategy, conversations regarding terminology in French have been carried forward, with initial research findings supplemented by workshops and intentional conversation circles. Although those engaged in this work so far are predominantly Québécoise, actively holding space and setting aside resources for the development of localized resources across the country can hopefully serve as small steps toward finding language that conveys ocean literacy to Canadian Francophonie at large.

Wading Deeper: Translating into Inuktitut

As a primarily Anglophone and settler research team, wading into the complexity of ocean literacy terminology was extremely challenging in the context of Indigenous languages. Across the country, it was clearly voiced that further time and resources need to be allocated to the co-creation of opportunities that bridge the term ocean literacy across language communities and build the understanding in a culturally appropriate manner.

Issues of language, power, and colonialism are deeply intertwined in understanding and naming the global ocean; attempts to translate between dominant languages and Indigenous languages only accentuate the tensions and power imbalances inherent in these human–ocean relationships. The recent proliferation of interest in writing about the “ocean” continues to centre European languages, thus perpetuating the colonial erasure of Indigenous Peoples who, as Te Punga Somerville (2017) writes, “have already been here” (p. 28). In considering the linguistic challenges of naming the ocean(s), particularly Oceania/the Pacific Ocean/Te Moananui-a-Kiwa, Te Punga Somerville suggests that “It is a truth universally acknowledged that there is no singular name for our ocean” (p. 25). For people throughout this region, Te Punga Somerville continues, “We can say that communities across the region collectively name the ocean through these specific names, but we can equally say there are as many oceans as there are languages here. How many is that? Over 1200 at last count” (p. 27). This notion that there are as many oceans as there are languages to name the ocean centres Indigenous knowledges, languages, and rights while also countering the North Atlantic/Anglophone/Eurocentric conceptualizations that recommend naming only one global ocean.

In an ideal world, all texts and resources would be given the space and means to be developed within the target language community, ensuring maximum relevance and community ownership of terms and concepts. However, in reality, with our resources and capacity, translation becomes a vital tool for moving toward sharing data more equitably, creating inclusive research, and ensuring materials reach the relevant audiences. Although we acknowledge the limited nature of ocean literacy in encompassing Indigenous worldviews, this perceived failing is also based on conversations that are taking place largely in English, which therefore do not take into consideration the numerous potential phrasings and nuances in another language. Although COLC has thus far only been able to lead ocean literacy exchanges and dialogues in English and French, perhaps the success of this translation lies in Inuktitut speakers' opportunity to give space to new words or ideas beyond the trappings of English.

Learning to Listen to Many Ocean Stories

Ocean literacy is a broad, internationally recognizable term, situated within an established community of practice and growing body of research (Borja et al., 2020). However, it is also, at least in a Canadian context and depending on the audience, an imperfect, problematic, narrow, irrelevant, exclusive, and/or unexciting term. The *Understanding Ocean Literacy in Canada* study, which directly informed the co-development of *Land, Water, Ocean, Us: A Canadian Ocean Literacy Strategy* (COLC, 2021b), was led by a small, all-female research team, with limited time and resources, while dealing with the additional challenges imposed by a global public health pandemic. And yet, of all the challenges faced in co-building an evidence-based, community-driven national strategy, the most persistent and significant sticking point has been the very term around which the project itself is built.

Such a situation leaves us with something of a paradox. After two years of research and engagement that has received input from over 3,000 Canadians, ocean literacy remains a dissatisfactory term. And yet, to break away from ocean literacy would be to remove the only label that has, as of yet, been able to unite the breadth of work that Canadians believe it should include. To continue with ocean literacy is, in many ways, contradictory to what we heard and, some would argue, harmful. And yet, to scrap ocean literacy would remove the scaffolding of the community and momentum that has propelled this project to where it is now and distance Canadian efforts from ongoing international dialogues and communities of practice. This dilemma is not new to the field of environmental education, which has struggled for decades with the proliferation of terminology that includes Education for Sustainable Development, Sustainability Education, and place-based education, among many others (Jickling & Sterling, 2017). With this in mind, Jickling and Sterling (2017) caution that “we think that endless pursuit of new signifiers will be dissatisfying and ultimately empty” (p. 6). As an alternative, the authors recommend a “fundamental re-thinking of education

and its purposes in a rapidly changing global context” (p. 6). If we are to heed this advice, where do we go from here?

To begin with, advancing ocean literacy in Canada will only be achieved by broadening our current understanding of what the ocean means for people in diverse contexts. Fostering strong relationships to land, freshwater, coastal areas, sea ice, and the open ocean—broadly understood as an ocean continuum—can be helpful for better expressing the interconnection of all “ocean features.” These relationships can also be strengthened by revitalizing Indigenous languages and creating space for linguistic diversity that allows us to engage with the thousands of oceans as they are known within distinct linguistic, cultural, and regional contexts. We suggest that Te Punga Somerville’s (2017) recommendation for her field of Ocean Studies is apt for this discussion on ocean literacy terminology: “I want to ask whether Ocean Studies might be better understood as if it were itself an ocean: without a singular starting point or origin; endlessly circulating. Not beyond genealogy, because nothing is, but possessed of a genealogy that is impossibly and beautifully wide” (p. 28). Rather than defining ocean literacy narrowly, that is according to Western, Anglophone, scientific ways of knowing that are deeply embedded in colonial practices of dispossession, erasure, and conquest, how might our relationship with the ocean change if dominant discourses stepped aside to allow other voices to emerge?

In addition to opening up the word “ocean” to include marginalized and silenced relationships with the ocean, reconceptualizing “literacy” as listening and storytelling practices that include oral and other naming practices (e.g., art, food, ceremony, dance) connected to land, water, and the ocean moves us beyond the deficit-based, instrumentalist, and narrowly-defined textual understandings of literacy without moving beyond the term itself. In fact, this reconceptualization opens up the term to multimodal, embodied, justice-oriented literacies (Schroeter, 2019) and the diverse ways in which ocean knowledges, ocean values, and ocean actions are at the heart of ocean literacy. While conceptualizing the ocean as a continuum is a first step in reframing this mindset, we acknowledge that as Canada moves into implementing a national strategy, we open the door for more conversations and progress in the next few years.

There are very real challenges that confront us in efforts to reconceptualize ocean literacy to include lived experiences and varied ways of knowing—ones that are outside of textual understandings of “literacy” and which may not always be adequately shared or understood in the conventional Western Anglophone paradigm (including the paradox of this very article that attempts to explore these tensions from within the written English language). Reserving space and time to collectively develop words and phrases that more fully represent the concept of ocean literacy is critical to ensuring greater relevance and inclusivity. Yet, there is an urgency to this work, as, with or without the perfect words, the national and international community is moving quickly and the crises facing the ocean require immediate action. The United Nations Decade of Ocean Science for Sustainable Development has launched, as has the first phase of

the Canadian Ocean Literacy Strategy and Implementation Plan (COLC, 2021a). Nevertheless, amidst these intense and important activities both nationally and internationally, questions about terminology cannot be sidelined by the urgent need for concrete ocean actions. Instead of shying away from the problematics of ocean literacy terminology, we can actively commit to creating spaces at the table for diverse perspectives to be shared and, more importantly, to be heard. For instance, the National Strategy's *Implementation Plan: Pathways for Collaboration* (COLC, 2021a) commits to supporting French and Indigenous language communities in the development of, and continued access to, multi-language resources and program offerings. It is important to continue funding translation efforts that enable materials to be available within and across diverse linguistic communities. Creating the time, space, and expertise to provide COLC research reports and the National Strategy and Implementation Plan in English, French, and Inuktitut was undeniably challenging for a small team to achieve in the context of the national study and National Strategy efforts. However, the importance of this commitment cannot be underestimated.

If we can learn anything from ocean literacy terminology, it is that literacy is an invitation into complicated conversations. Rather than moving *beyond* the term by definitively accepting or rejecting “ocean literacy,” whereby we risk denying both the valid critiques and the merits of the term, we suggest that staying “beside” (Sedgwick, 2003) the term creates space for marginalized voices to redefine both ocean(s) and literacy in generative ways. As Kosofsky Sedgwick (2003) writes, “the irreducibly spatial positionality of beside also seems to offer some useful resistance to the ease with which beneath and beyond turn from spatial descriptors into implicit narratives of, respectively, origin and telos” (p. 8). From this position of *beside* the dominant narratives of the ocean, we reimagine inclusive, more fluid storytelling practices based on relationships that create space for all voices to be heard and, most importantly, we learn new ways to listen and take action for the common good. In recognition of these central tensions to this work, there is also a central truth to which we can always return: The ocean has a place in all our stories. We just might each have a different way of telling them.

Acknowledgements

The authors would like to thank the contributions and support of our extended research team, including Justine Ammendolia, Noémie Roy, Shannon Monk, David Shiffman, Boris Worm, Chris Milley, Claudia Aporta, David Zandvliet, Sonia Wesche, Whitney Lackenbauer, and our anonymous reviewers.

We are grateful for the financial support from Fisheries and Oceans Canada, Ocean Frontier Institute, Mitacs, Marine Environmental Observation, Prediction and Response Network (MEOPAR), NIVA Inc., Students on Ice, Marine Institute, Ocean Wise, Clean Foundation, Stratos Inc., JASCO Applied Sciences, Ocean Networks Canada, and Environment and Climate Change Canada.

Notes

Research ethics for this study was approved by the following: Dalhousie University (REB# 2019-4891) for National, Atlantic and Inland research protocols; Simon Fraser University (REB# 2019s0334) for Pacific research protocols; University of Ottawa (# S-09-19-5040) for St. Lawrence research protocols; and Trent University (IEC/DERC Ethics #25944) for Inuit Nunangat research protocols, with further approvals granted by Aurora Research Institute (#16679) and the Nunatsiavut Government Research Advisory Committee (#10269769). Inuit Nunangat research exemptions were granted by the Nunavut Research Institute and Nunavik Research Centre as research did not take place on territorial lands.

References

- Ammendolia, J., Glithero, L., MacNeil, S., & Monk, S. (2020). *Understanding Ocean Literacy in Canada: Inland Canada Regional Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/07/COLC_Inland-Canada-Regional-Report_Final.pdf
- Apoqnmatliti'k. (n.d.). *Indigenous and local knowledge*. Retrieved January 4, 2021, from <https://www.apoqnmatliti'k.ca/ways-of-knowing>
- Borja, A., Santoro, F., Scowcroft, G., Fletcher, S., & Strosser, P. (2020). Editorial: Connecting people to their oceans: Issues and options for effective Ocean Literacy. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2019.00837>
- Canadian Ocean Literacy Coalition. (2021a). *Implementation Plan: Pathways for Collaboration*. Retrieved from: https://colcoalition.ca/wp-content/uploads/2021/03/Implementation_Plan_Pathways_for_Collaboration_March_2021.pdf
- Canadian Ocean Literacy Coalition. (2021b). *Land, Water, Ocean, Us: A Canadian Ocean Literacy Strategy*. Retrieved from: https://colcoalition.ca/wp-content/uploads/2021/03/Land-Water-Ocean-Us_-_A-Canadian-Ocean-Literacy-Strategy_March-2021.pdf
- Cava, F., Schoedinger, S., Strang, C., & Tuddenham, P. (2005). *Science Content and Standards for Ocean Literacy: A Report on Ocean Literacy*. Retrieved May 2020 from https://coexploration.org/oceanliteracy/documents/OLit2004-05_Final_Report.pdf
- Conway, K. (2012). Cultural translation. In Y. Gambier & L. van Doorslaer (Eds.), *Handbook of Translation Studies* (4th ed., pp. 21–25). John Benjamins Publishing.
- Disinger, J. F., & Roth, C. E. (1992). Environmental literacy. *ERIC Clearinghouse for Science Mathematics and Environmental Education*. ERIC/CSMEE Digest. <https://files.eric.ed.gov/fulltext/ED351201.pdf>
- Fielding, S., Copley, J. T., & Mills, R. A. (2019). Exploring our oceans: Using the global classroom to develop Ocean Literacy. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2019.00340>
- Fisheries and Oceans Canada. (2021). *Canada's oceans agenda*. Retrieved January 2021 from: <https://dfo-mpo.gc.ca/campaign-campagne/oceans/index-eng.html>

- Fisheries and Oceans Canada. (2011). *Canada's state of the oceans report, 2012*. <https://waves-vagues.dfo-mpo.gc.ca/Library/346701.pdf>
- Fisheries and Oceans Canada. (2002). *Canada's oceans strategy: Our oceans, our future*. <https://waves-vagues.dfo-mpo.gc.ca/Library/264675.pdf>
- Fransman, J. (2006). *Understanding literacy: A concept paper* (Paper commissioned for the EFA Global Monitoring Report 2006, Literacy for Life). <https://unesdoc.unesco.org/ark:/48223/pf0000145986>
- Glithero, L. (2020). *Understanding Ocean Literacy in Canada: National Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/08/COLC_National-Report_Final_2020.pdf
- Glithero, L., Simon, M., Waterfall, P., & Watson-Wright, W. (2020). *The heart of our biosphere: Exploring our civic relationship with the ocean in Canada*. Canadian Commission for UNESCO's IdeaLab.
- Glithero, L., & Zandvliet, D. (2020, June). *Canadian ocean literacy survey: Highlight Report*. Canadian Ocean Literacy Coalition. <https://colcoalition.ca/wp-content/uploads/2020/06/COLSurvey-Highlights-Report-FINAL-1.pdf>
- Guest, H., Lotze, H. K., & Wallace, D. (2015). Youth and the sea: Ocean literacy in Nova Scotia, Canada. *Marine Policy*, 58, 98-107. <https://doi.org/10.1016/j.marpol.2015.04.007>
- Hoover, C. (2020) *Understanding Ocean Literacy in Canada: Inuit Nunangat Regional Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/07/COLC_Inuit-Nunangat-Regional-Report_EN_Final_July-2020.pdf
- Institute for Integrative Science and Health, n.d. *Two-eyed seeing*. Retrieved January 4, 2021, from <http://www.integrativescience.ca/Principles/TwoEyedSeeing/>
- Inuit Circumpolar Council Canada. (2008). *The sea ice is our highway An Inuit perspective on transportation in the Arctic*.
- Inuit Tapiriit Kanatami. (2020). *Inuit Nunangat map*. <https://www.itk.ca/inuit-nunangat-map/>
- Inuit Tapiriit Kanatami. (2019). *ITK Board Of Directors adopts Inuktitut Qaliujaaqpait as unified orthography for Inuktitut*. <https://www.itk.ca/itk-board-of-directors-adopts-inuktitut-qaliujaaqpait-as-unified-orthography-for-inuktitut/>
- Inuit Tapiriit Kanatami. (2018). *National Inuit Strategy on Research*. <https://www.itk.ca/wp-content/uploads/2020/10/ITK-National-Inuit-Strategy-on-Research.pdf>
- Inuit Tapiriit Kanatami. (2004). *Inuit History and Heritage*. http://www.itk.ca/sites/default/files/5000YearHeritage_0.pdf
- Jickling, B., & Sterling, S. (2017). Post-sustainability and environmental education: Framing issues. In: B. Jickling & S. Sterling (Eds.), *Post-sustainability and environmental education: Remaking Education for the Future* (pp. 1-11). Palgrave MacMillan. https://doi-org.proxy.lib.sfu.ca/10.1007/978-3-319-51322-5_1
- Karetak, J., Tester, F., & Tagalik, S. (2017). *Inuit Qaujimagatuqangit: What Inuit have always known to be true*. Fernwood Publishing.
- Katan, D. (2014) *Translating cultures: An introduction for translators, interpreters and mediators* (2nd ed.). Routledge. https://books.google.com/books?hl=en&lr=&id=OpK3AwAAQBAJ&oi=fnd&pg=PP1&dq=translation+localization+worldview&ots=eCHwhLDxC&sig=KdjGFO0dHiPKuT9N2JCyrrn_vt5k#v=onepage&q&f=false

- Kopke, K., Black, J., & Dozier, A. (2019, February 19). Stepping out of the ivory tower for Ocean Literacy. *Frontiers in Marine Science*. <https://doi.org/10.3389/fmars.2019.00060>
- Kwauk, C. (2020). *Roadblocks to quality education in a time of climate change*. Center for Universal Education at Brookings. <https://www.brookings.edu/wp-content/uploads/2020/02/Roadblocks-to-quality-education-in-a-time-of-climate-change-FINALpdf?fbclid=IwAR1JEURYgyZJEiy7K5rbLjYGbswu8mAz2HkpxwspVjpRFohqvL8eQDCfXM>
- Lubchenco, J. and Gaines, S. (2019). A new narrative for the ocean. *Science*, 364, pp. 991. Retrieved from: <https://science.sciencemag.org/content/364/6444/911.abstract>
- MacNeil, S. (2020) *Understanding Ocean Literacy in Canada: St. Lawrence Regional Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/07/COLC_St.-Lawrence-Regional-Report_Final.pdf
- McKinley, E., Acott, T., & Stojanovic, T. (2019). Socio-cultural dimensions of marine spatial planning. In J. Zaucha & K. Gee (Eds.), *Maritime spatial planning: Past, present, future* (pp. 151-174). Springer International Publishing. https://doi.org/10.1007/978-3-319-98696-8_7
- McKinley, E., & Fletcher, S. (2010). Individual responsibility for the oceans? An evaluation of marine citizenship by UK marine practitioners. *Ocean & Coastal Management* 53(7), 379-384
- Nabokov, V. (1992). Problems of translation: Onegin in English. In R. Schulte & J. Biguenet, (Eds.), *Theories of translation: An anthology of essays from Dryden to Derrida* (pp. 127-143). University of Chicago Press. (Reprinted from *Partisan Review*, 1955, Fall, 22[4], 498-512.)
- Nanos. (2019, December). *Large majority of Canadians agree that the ocean plays an important role in Canada's economy and would like Canada to be an international leader in ocean protection: COLC survey summary*. (Submission 2019-1512). <https://colcoalition.ca/colc-publications/national-reports/national-survey/>
- National Oceanic and Atmospheric Administration. (2013, March). Ocean Literacy: The essential principles and fundamental concepts of Ocean Sciences for learners of all ages (version 2). <https://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf>
- Online Etymology Dictionary. (2021). Ocean. In *Online Etymology Dictionary*. Retrieved March 10, 2021, from <https://www.etymonline.com/search?q=ocean>
- Ostertag, J., & Ammendolia, J. (2020). *Understanding Ocean Literacy in Canada: Atlantic Regional Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/07/Atlantic-Regional-Report_Final.pdf
- Rasmussen, D., & Akulukjuk, T. (2009). "My father was told to talk to the environment first before anything else": Arctic environmental education in the language of the land. In M. McKenzie, P. Hart, H. Bai, & B. Jickling (Eds.), *Fields of Green: Restoring culture, environment, and education* (pp. 279-294). Hampton Press.
- Reid, A. J., Eckert, L. E., Lane, J.-F., Young, N., Hinch, S. G., Darimont, C. T., Cooke, S. J., Ban, N. C., & Marshall, A. (2020). "Two-Eyed Seeing": An Indigenous framework to transform fisheries research and management. *Fish and Fisheries*, 22(2), 243-261 <https://doi.org/10.1111/faf.12516>
- Roy, N. (2020). *Youth and Ocean Literacy in Canada: Key findings and recommendations*. Canadian Ocean Literacy Coalition.
- Santoro, F., Santin, S., Scowcroft, G., Fauville, G., & Tuddenham, P. (2017). *Ocean Literacy for all: A toolkit* (IOC Manuals and Guides, 80). IOC/UNESCO & UNESCO Venice Office. <https://unesdoc.unesco.org/ark:/48223/pf0000260721>

- Schroeter, S. (2019). Embodying difference: A case for anti-racist and decolonizing approaches to multiliteracies. *Studies in Social Justice*, 13(1), 142–158.
- Scully, S. (2018). *Ocean Literacy in Canada: Literature review*. Canadian Ocean Literacy Coalition. <https://colcoalition.ca/wp-content/uploads/2020/02/literature-review-web.pdf>
- Sedgwick, E. K. (2003). *Touching feeling: Affect, pedagogy, performativity*. Duke University Press.
- Shiffman, D., Yumagulova, L., & Glithero, L. (2020) *Ocean Literacy in the Canadian media: Highlights report*. Canadian Ocean Literacy Coalition.
- Shorefast Foundation (2016) *The New Ocean Ethic 2016*. <https://www.shorefast.org/perch/resources/shorefast-foundation-new-ocean-ethic-booklet-2016.pdf>
- Statistics Canada. (2017). *Linguistic diversity and multilingualism in Canadian homes: Census of Population, 2016*. <https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016010/98-200-x2016010-eng.pdf>
- Stewart, A. (2019). *What is Canadian Ocean Literacy?* http://oceanliteracy.ca/wp-content/uploads/What-is-Canadian-Ocean-Literacy-Nov_19.pdf
- Sterling, S. (2009). Ecological intelligence: Viewing the world relationally. In A. Stibbe (Ed.), *The handbook of sustainability literacy: Skills for a changing world* (pp. 77-83). Green Books Ltd.
- Stibbe, A. and Luna, H. (2009). Introduction. In A. Stibbe (Ed.), *The handbook of sustainability literacy: Skills for a changing world* (pp. 9-16). Green Books Ltd.
- Te Punga Somerville, A. (2017). Where oceans come from. *Comparative Literature*; 69(1), 25-31. <https://doi.org/10.1215/00104124-3794579>
- Unama'ki Institute of Natural Resources. (n.d.). *Netukulimk*. Retrieved January 4, 2020, from <https://www.uinr.ca/programs/netukulimk/>
- UNESCO. (n.d.). *Literacy*. Retrieved January 10, 2021, from <https://en.unesco.org/themes/literacy>
- Utoikamanu, F. (n.d.). Safeguarding cultural and linguistic diversity in the context of global citizenship. *UN Chronicle*. <https://www.un.org/en/chronicle/article/safeguarding-cultural-and-linguistic-diversity-context-global-citizenship>
- Vinay, J.-P., & Darbelnet, J. (1995). *Comparative stylistics of French and English: A methodology for translation* (J. C. Sager & M.-J. Hamel, Trans.). John Benjamins. (Original work published 1958). <https://doi.org/10.1075/btl.11>
- West Coast Environmental Law. (2019a, February 13). Respecting and taking care of our ocean relatives: The creation of the Hailzaqv Nation Oceans Act. *West Coast Environmental Law* <https://www.wcel.org/blog/respecting-and-taking-care-our-ocean-relatives-creation-hailzaqv-nation-oceans-act>
- West Coast Environmental Law [WCELAW]. (2019b, February 13). *Respecting and taking care of our ocean relatives: The creation of the Hailzaqv Nation Oceans Act* [Video]. YouTube. <https://www.youtube.com/watch?v=hho410njyXM>
- Yumagulova, L. (2020). *Understanding Ocean Literacy in Canada: Pacific Regional Report*. Canadian Ocean Literacy Coalition. https://colcoalition.ca/wp-content/uploads/2020/07/COLC_Pacific-Regional-Report_Final.pdf

Reviewers for Volume 24 [1]

Dr. Leesa Fawcett, Associate Professor
Faculty of Environmental and Urban Change, York University

Dr. Carie Hoover, Research Associate
Marine Affairs Program
Dalhousie University

Sara Karn, Doctoral Candidate
Faculty of Education, Queen's University

Dr. Doug Karrow, Associate Professor
Department of Educational Studies, Brock University

Dr. Shannon Leddy, Assistant Professor
Department of Curriculum and Pedagogy
Faculty of Education, University of British Columbia

Sarah MacNeil, MA
Canadian Ocean Literacy Coalition

Dr. Lyne Morissette
M- Expertise Marine

Dr. Nicholas Ng-A-Fook
Professor of Curriculum Studies and Vice-Dean of Graduate Studies
Faculty of Education, University of Ottawa

Dr. Julia Ostertag, Adjunct Professor
Marine Affairs Program, Dalhousie University

Dr. Sandra Scott, Associate Professor
Department of Curriculum and Pedagogy
Faculty of Education, University of British Columbia

Dr. Gloria Snively, Professor Emeritus
Faculty of Education, University of Victoria

Tim Straka, MSc., MEd.
Polar Knowledge Canada

Patrick Wells, Doctoral Candidate
Faculty of Education, Memorial University

Website

Thank you to Jason Zou at Lakehead University for his work on the website:
<http://cjee.lakeheadu.ca>

Guidelines for Contributors

Contributions may take the form of research articles, reports, evaluations, case studies, critical essays, practitioner reflections, and reviews. Theoretical essays or research reports should include a description of the practical applications of the ideas raised or tested, while reports of teaching practice or techniques should contain an explanation of the theoretical foundation underlying the practice or technique in question.

Manuscripts will be reviewed by at least two advisory editors or invited consultants with relevant expertise. Contributors may wish to supply names and addresses of potential reviewers. The selection of articles for inclusion in the journal will be based on these reviews. Submissions are accepted as early as September 1st and no later than November 1st of each year, allowing for a timely review process.

Submissions

Manuscripts should be clearly written and well-organized and will be edited for clarity and brevity.

Electronic submissions are requested. Please check the following website for instructions and updates: < <http://cjee.lakeheadu.ca/> > .

All submissions should include a brief abstract to a maximum of 125 words and a minimum of five key words for referencing of papers. The name and affiliation of the author(s) should appear on a separate title page to ensure anonymity during the reviewing process. Authors should retain an exact copy of this manuscript in order to respond to requests for clarification of specific pages, paragraphs, or lines. Microsoft Word is the preferred format.

Manuscripts are accepted for publication on the understanding that they have been submitted only to the *Canadian Journal of Environmental Education* and that copyright of the published articles will be owned by the journal. Authors are responsible for the factual accuracy of their papers and for obtaining permission to reproduce text or illustrations from other publications.

The *Canadian Journal of Environmental Education* will not normally publish feature articles by the same author in consecutive issues. Exceptions may be considered in cases of contiguous work. This limitation does not apply to short analyses, response pieces, or book reviews.

Papers should not exceed a **maximum of 7000 words**. To check manuscript length we conduct a computerized word-count that includes the abstract, endnotes, references, and bibliographical sketch(es) of author(s). In exceptional circumstances a slightly longer paper may be submitted, but this should be negotiated, in advance, with the editors. It is the author(s)' responsibility to ensure that his/her paper meets these guidelines. Long papers may be returned to authors at any stage of the review or production processes. To avoid disappointment, please take care.

Style

Publication Manual of the American Psychological Association, 7th edition (APA), must be used as a style reference. Explanatory notes should be avoided whenever possible. Essential notes should be identified with consecutive superscripts and listed in a section entitled “Notes” at the end of the text. Papers not formatted in APA style may be returned to authors at any stage of the review or production processes.

Citations are normally presented in a list of references. Please check that in-text references match your list of references, double-checking that dates match. Please refer to the following examples:

In text:

(Greenall Gough, 1993)

(Kurth-Schai, 1992; Merchant, 1980; Warren & Cheney, 1991)

References:

Egan, K. (1989). Individual development. In K. Egan, A. Luke, & S. de Castell (Eds.), *Literacy, society, and schooling* (pp. 243-255). New York: Cambridge University Press.

Greenall Gough, A. (1993). *Founders in environmental education*. Deakin University Press.

Warren, K. J. & Cheney, J. (1991). Ecological feminism and ecosystemecology. *Hypatia*, 6(1), 179-197.

Canadian spellings will normally be used. However, alternative approaches to both form and spelling will be considered when integral to the “voice” presented.

Illustrations, Figures, and Tables

Only those illustrations, figures, and tables essential to reader understanding should be included.

Illustrations, figures, and tables should be provided in finished form suitable for reproduction and be no larger than 18 x 11.75 cm or 7 x 4.25 inches. Figure legends should be typed together on a separate page.

Correspondence

All correspondence should be addressed to:

Canadian Journal of Environmental Education

c/o Teaching Hub, Nipissing University, 100 College Drive, Box 5002

North Bay, Ontario, P1B 8L7, CANADA

or cjee.editors@nipissingu.ca

Manuscripts should be submitted at < <http://cjee.lakeheadu.ca> > .

