The Ocean Incubator Network Learning Toolkit

Margherita Paola Poto
Laura Vita

Margherita Paola Poto
Faculty of Law
UiT The Arctic University of Norway
Tromsø, Norway

Laura Vita
Faculty of Law
UiT The Arctic University of Norway
Tromsø, Norway

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and Shamim Wasii Nyanda

Co-creation of Knowledge

*Margherita Paola Poto, Laura Vita, Igor Peftiyev,
Zia Madani, and Olena Peftieva*

Abstract (English) This chapter provides a comprehensive overview of co-creation as a methodological approach, specifically within the context of ocean literacy. It is structured into five sections, each aimed at deepening the understanding and practical application of co-creation. Section 1 sets the stage by outlining the chapter's scope and structure. Section 2 defines co-creation, starting from its relevance in climate law

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M.P. Poto, UiT The Arctic University of Norway contributed to the draft, design and writing and revision of the entire chapter.

L. Vita, MSc McMaster, Canada and OIN Project developer, contributed to the draft, design, writing, revision, and proofreading of the entire chapter, and developed the infographic of the abstract and of knowledge co-creation (see Visual Abstract).

I. Peftyiev, LLM, Mariupol State University, wrote the concluding remarks in Sect. 5.2, as well as the abstracts in Russian and Ukrainian.

Z. Madani, Institute of Humanities and Social Sciences, University of Tsukuba, Japan, contributed to Sect. 2.2.

O. Peftieva, The Center for Ocean and Society, Kiel University and Mariupol State University, contributed to Sect. 5.2 by suggesting the co-created activity using critical discourse analysis. The work during the Living Laboratory was conducted in cooperation with Sarah Parry and Tahnee Prior.

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studies, then describes its two components, and then focuses on its specific application in ocean literacy. In Sect. 3, the concept of knowledge co-creation is aligned with the two thematic pathways. This section bridges the theoretical foundations with the practical implications of co-creation in enhancing ocean literacy. Section 4 examines the co-creation process by reflecting on the guiding questions used during the OIN Living Laboratory in Copenhagen, in May 2024. These questions played a crucial role in directing the discussions and activities of the working group, showcasing a structured approach to exploring co-creation that could be replicated in future projects. The chapter culminates in Sect. 5, which presents the ideas developed by the co-creation group during the Living Laboratory, demonstrating how co-creation can be effectively understood and implemented in ocean literacy. This section translates theoretical concepts into practical, actionable insights, enabling readers to experiment with and apply co-creation approaches and contribute to ocean literacy.

Аннтоация (Русский)   Данная глава представляет собой всесторонний обзор совместного творчества как методологического подхода, в частности, в контексте океанической грамотности. Структура главы состоит из пяти разделов, каждый из которых направлен на углубление понимания и практического применения совместного творчества. Раздел 2 определяет совместное творчество, начиная с его актуальности в исследованиях климатического права, затем описывает его две составляющие и затем фокусируется на его конкретном применении в океанической грамотности. В разделе 3 концепция совместного создания знаний корелируется с двумя тематическими путями. Этот раздел связывает теоретические основы с практическими результатми совместного творчества для повышения океанической грамотности. Раздел 4 исследует процесс совместного творчества, размышляя над основными вопросами, поднятыми во время Живой Лаборатории. Эти вопросы сыграли решающую роль в направлении обсуждений и деятельности рабочей группы, демонстрируя структурированный подход к изучению совместного творчества, который может быть использован в будущих проектах. Глава завершается разделом 5, в котором представлены идеи, разработанные группой совместного творчества во время Живой Лаборатории, демонстрируя, как как механизмы совместного творчества могут быть успешно внедрены и реализованы в океанической грамотности. Этот раздел переводит теоретические концепции в практические, применимые идеи, позволяя

читателям экспериментировать с подходами совместного творчества и вносить свой вклад в океаническую грамотность.

Анотація (Українська) Ця глава представляє собою всебічний огляд спільної творчості як методологічного підходу, зокрема в контексті океанічної грамотності. Структура глави складається з п'яти розділів, кожен з яких спрямований на поглиблення розуміння та практичного застосування спільної творчості. Розділ 2 визначає спільну творчість, починаючи з її актуальності у дослідженнях кліматичного права, далі описує її дві складові та зосереджується на її конкретному застосуванні в океанічній грамотності. У розділі 3 концепція спільного створення знань корелюється з двома тематичними шляхами. Цей розділ пов'язує теоретичні основи з практичними результатами спільної творчості для підвищення океанічної грамотності. Розділ 4 досліджує процес спільної творчості, розмірковуючи над основними питаннями, що виникли під час Живої Лабораторії. Ці питання відіграли вирішальну роль у напрямку обговорень та діяльності робочої групи, демонструючи структурований підхід до вивчення спільної творчості, який може бути використаний у майбутніх проєктах. Глава завершується розділом 5, у якому представлені ідеї, розроблені групою спільної творчості під час Живої Лабораторії, демонструючи, як механізми спільної творчості можуть бути успішно впроваджені та реалізовані в океанічній грамотності. Цей розділ перетворює теоретичні концепції в практичні, застосовні ідеї, дозволяючи читачам експериментувати з підходами спільної творчості та вносити свій внесок у розвиток океанічної грамотності.

Abstract (Italiano) Il capitolo offre una panoramica del concetto di co-creazione dal punto di vista metodologico, specificamente nel contesto dell'*ocean literacy*. È strutturato in cinque paragrafi (*sections*). *Section 1* prepara il terreno delineando l'ambito e la struttura del capitolo. *Section 2* contiene la definizione di co-creazione, partendo dalla sua rilevanza nella ricerca sul diritto del clima e poi concentrando l'attenzione sulla sua applicazione specifica nell'ambito dell'*ocean literacy*. Nella *section 3*, il tema della co-creazione viene esaminato alla luce dei due *pathways* dell'*ocean literacy*. La *section 4* esamina il processo di co-creazione riflettendo sulle domande guida proposte alle partecipanti del Living Laboratory (maggio 2024). Il capitolo culmina con la section 5, offrendo esempi pratici di attività che dimostrano come la co-creazione possa essere compresa ed implementata efficacemente nel campo dell'*ocean literacy*.

چکیده (پارسی) این فصل در پی بررسی فراگیر فرآیند هم‌آفرینی به عنوان یک رویکرد روش‌شناختی است، به‌ویژه در زمینه دانش دریایی. این فصل به پنج بخش دسته‌بندی شده است که هر یک برای تعمیق درک و کاربرد عملی هم‌آفرینی طراحی شده‌اند. بخش نخست با بیان دامنه و ساختار فصل، زمینه را آماده می‌کند. بخش دوم هم‌آفرینی را تعریف می‌کند، از اهمیت آن در مطالعات حقوق اقلیم گفته، سپس دو مؤلفه آن را توصیف می‌کند و در نهایت بر کاربرد خاص آن در دانش دریایی متمرکز می‌شود. در بخش سوم، مفهوم هم‌آفرینی دانش با دو مسیر موضوعی هماهنگ می‌شود. این بخش پایه‌های نظری را با پیامدهای عملی هم‌آفرینی در افزایش دانش دریایی پیوند می‌دهد. بخش چهارم به فرآیند هم‌آفرینی می‌پردازد و به پرسش‌های راهنمای استفاده شده در آزمایشگاه زنده او.آی.ان (OIN) در کپنهاگ، در ماه مه ۲۰۲۴، نگاهی می‌اندازد. این پرسش‌ها نقش اساسی در هدایت گفتگوها و فعالیت‌های گروه کاری داشته و نمایان‌گر یک رویکرد ساختارمند برای بررسی هم‌آفرینی بودند که می‌تواند در پروژه‌های آینده بکار گرفته شود. این فصل در بخش پنجم به اوج خود می‌رسد و با ارایه ایده‌های پدیدآمده توسط گروه هم‌آفرینی در آزمایشگاه زنده، نشان می‌دهد که چگونه هم‌آفرینی می‌تواند به طور کارآمد درک و پیاده‌سازی شود. این بخش مفاهیم نظری را برگردان به بینش‌های عملی و قابل اجرا می‌کند و به خوانندگان این امکان را می‌دهد تا با روش‌های هم‌آفرینی آنها را آزمایش کرده و به کار گیرند و به دانش دریایی یاری رسانند.

Visual Abstract
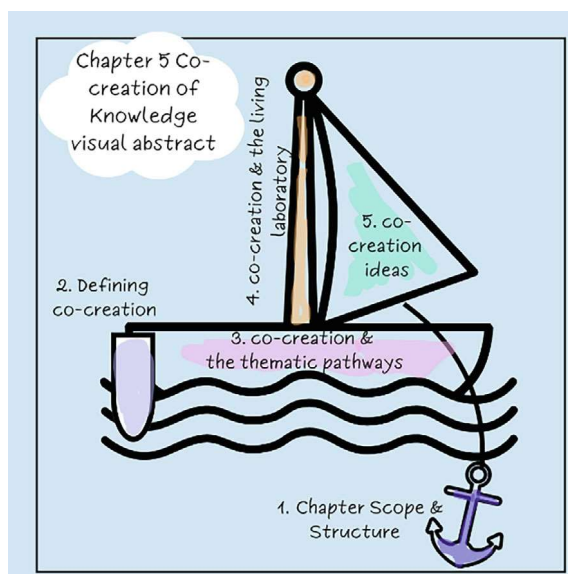
Laura Vita 2024

Keywords Co-creation · Methodological approach · Components · Process · Example · Ocean Literacy · Activities

1   INTRODUCTORY REMARKS

This chapter unfolds across five sections, each designed to deepen the understanding of co-creation as a methodological approach within the context of ocean literacy.

The chapter begins with an introduction that outlines the scope and objectives, setting the stage for a detailed exploration of the topic.

Following this introduction, Sect. 2 defines co-creation as a methodological approach, initially within the broader spectrum of climate law studies, before narrowing down to its specific application to ocean literacy. This definition is crucial as it guided our reflections on co-creation in ocean literacy from the inception of OIN to its implementing activities, providing the conceptual framework for the work conducted by the entire OIN team, offering guidelines for the work developed by the co-creation group during the Living Laboratory, and then finally inspiring all the activities mapped in this Toolkit.

Section 3 examines how the defined concept of knowledge co-creation aligns with the two thematic pathways identified in our project and highlighted in this book. This specific section connects the theoretical foundations with the practical implications of co-creation in ocean literacy.

In Sect. 4, the narrative moves to an overview of the guiding questions distributed to the working group during the Living Laboratory. These questions played a key role in guiding the group's discussions and activities, offering a structured framework for delving into co-creation. Additionally, they can serve as valuable guidelines for future strategies for those engaging with co-created approaches in ocean literacy and other areas.

The chapter concludes with Sect. 5, which presents practical examples of activities that illustrate how the concept of co-creation can be understood, taught, and implemented in the field of ocean literacy. This section aims to translate theoretical concepts into practical, actionable insights, enabling readers, learners and the ocean literacy community at large to experiment with and apply co-creation principles in real-world scenarios.

2   CO-CREATION AS A METHODOLOGICAL APPROACH WITH TWO COMPONENTS

In pursuing ocean literacy, we underscore the significance of knowledge co-creation, which involves active participation and input from individuals across various disciplines in research and education endeavours.[1] Previous research in the fields of climate law and knowledge co-production has highlighted the dual nature of the co-creation of knowledge, which is crucial for understanding its application in inter-, trans-, and cross-disciplinary environmental research.[2] In this sense, the OIN team has conceptualized co-creation as a methodological approach and identified two elements: a subjective component, characterized by the involvement of a diverse array of collaborating actors of co-creation (or the *subjects* of co-creation), and an objective component, which involves the intersection and interaction of multiple disciplines (diverse sectors and discipline becoming the *objects* of co-creation) (Figs. 1 and 2).[3]

2.1   *The Subjective Component of Co-creation*

As for the subjective component, in the scholarly examination of co-creation actors, particularly within the context of climate governance processes—which is also pertinent to discussions on ocean literacy—Hege Hofstad et al. highlight the necessity for co-creation strategies to be underpinned by robust institutional design and proactive public leadership.[4] Institutional design necessitates the development of platforms and

[1] Lohse, E. J., & Poto, M. P. (2023). *Coproduction of knowledge in climate governance*, Berliner Wissenschafts-Verlag, ISBN 978-3-8305-5538-4.

[2] Poto, M. P., Porrone A., & Hayden-Nygren J. (2023), Knowledge co-creation as a methodological approach. participatory approaches to environmental legal research, in Lohse, E. J., & Poto, M. P. (eds.) *Coproduction of knowledge in climate governance*, Berliner Wissenschafts-Verlag, ISBN 978-3-8305-5538-4, p. 2728.

[3] Poto, M. P., Lohse E. J., & Owino, R. (2023), Mapping co-production of knowledge, in Lohse, E. J., & Poto, M. P. (eds.), *Coproduction of knowledge in climate governance*, Berliner Wissenschafts-Verlag, ISBN 978-3-8305-5538-4.

[4] Hofstad, H., Sørensen, E., Torfing, J., & Vedeld, T. (2022). Designing and leading collaborative urban climate governance: Comparative experiences of co-creation from Copenhagen and Oslo. *Environmental Policy and Governance*, *32*(3), 203–216.

Fig. 1 Co-creation as a
methodological
approach. Infographics
by Laura Vita
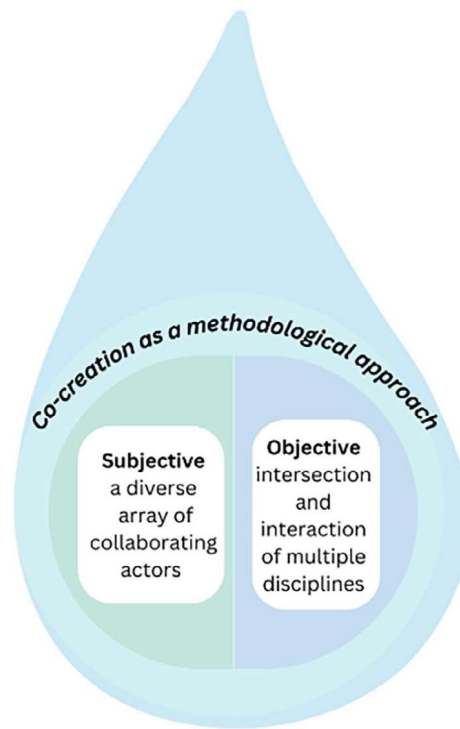
arenas that establish an organizational framework conducive to collabora-
tive processes governed by clearly defined rules.[5] Within this structured
space, public leadership is posited as crucial for promoting, supporting,
and guiding co-creation initiatives.[6] Specifically, leaders are tasked with

[5] Ansell, C., & Gash, A. (2018). Collaborative platforms as a governance strategy. *Journal of Public Administration Research and Theory, 28*, 16–32. https://doi.org/10. 1093/jopart/mux030.

[6] Hofstad, H., Sørensen, E., Torfing, J., & Vedeld, T. (2022). Designing and leading collaborative urban climate governance: Comparative experiences of co-creation from Copenhagen and Oslo. *Environmental Policy and Governance, 32*(3), 203–216; Hofstad, H., Sørensen, E., Torfing, J., & Vedeld, T. (2021). Leading cocreation for the green shift. *Public Money & Management*, 1–10. https://doi.org/10.1080/09540962.2021. 1992120.
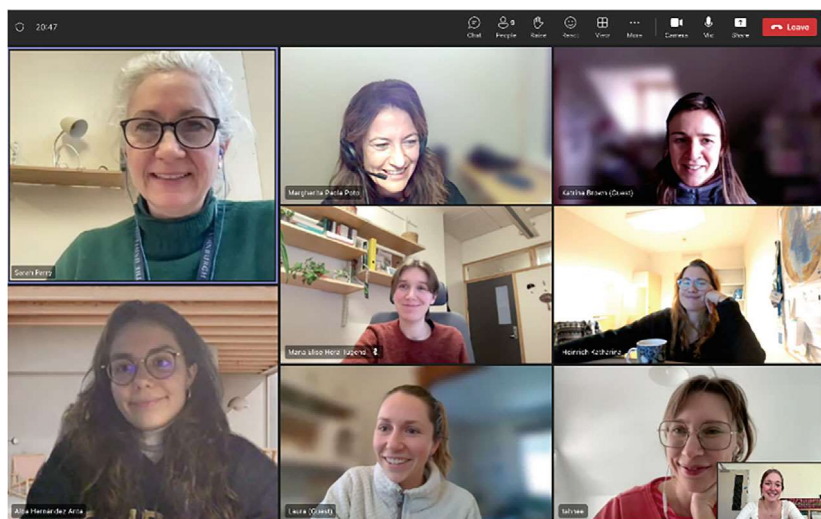
Fig. 2 Transdisciplinary OIN team participating in one of the Monthly Coffee Meetings (*Photo* Emily Murray)

developing, disseminating, and maintaining shared perspectives, determining activities, and exploring solutions to complex issues through the empowerment of involved actors and the facilitation of cross-sectoral collaboration.[7]

[7] Hofstad, H., Sørensen, E., Torfing, J., & Vedeld, T. (2022). Designing and leading collaborative urban climate governance: Comparative experiences of co-creation from Copenhagen and Oslo. *Environmental Policy and Governance, 32*(3), 203–216.

Such a model is built on the foundational concept of polycentric governance,[8] which posits that, in addition to leaders seen as facilitators of the process, a diverse array of key actors emerges as knowledge translators, learners and teachers, and experts in developing educational and learning methodologies.[9] This approach emphasizes a dynamic and interactive approach to governance, where facilitation and adaptability become central to navigating and managing complex governance landscapes. Moreover, it underscores the importance of positionality—recognizing each actor's situated knowledge,[10] and a commitment to inter-cross-transdisciplinarity, where participants collaborate to forge new understandings and solutions to complex transboundary challenges.[11]

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[8] Hofstad, H., & Vedeld, T. (2021). Exploring city climate leadership in theory and practice: Responding to the polycentric challenge. *Environmental Policy and Planning*, 1–15, 496–509. https://doi.org/10.1080/1523908X.2021.1883425. For polycentric governance all the studies of Elinor Ostrom are of relevance: Ostrom E. (1998). Scales, polycentricity, and incentives: Designing complexity to govern complexity, in Guruswamy, M. (eds.), *Protection of global biodiversity: Converging strategies*, Duke University Press, Raleigh, pp. 149–167. Ostrom, E., & Ostrom, V. (1977). Public economy organization and service delivery. Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, pp. 1–53; Ostrom, V., & Ostrom, E. (1977). A theory for institutional analysis of common pool problems. Managing the Commons. Freeman, San Francisco, pp. 157–172; Ostrom, V., & Ostrom, E. (1977). Public goods and public choices. Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, pp. 1–42; Ostrom, E., Whitaker. (1973). Does local community control of police make a difference? Some preliminary findings. *American Journal of Political Science,* 48–76; Ostrom, E., Baugh, Guarasci, Parks, Whitaker. (1973). *Community organization and the provision of police services.* Sage, Beverly Hills, CA, Ostrom, E., Parks, Whitaker, Percy. (1978). The public service production process: A framework for analyzing police services. *Policy Studies Journal, 7*(s1), 381–389. Ostrom, E., Parks, Percy, Whitaker. (1979). Evaluating police organization. *Public Productivity Review,* 3–27. Ostrom, E. (1985). Formulating the elements of institutional analysis. Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington.

[9] Panieri G., Poto, M. P., & Murray E. M. (ed.). (2024). *Emotional and ecological literacy for a more sustainable society.* Palgrave Macmillan, Springer Nature, ISBN: 978-3-031-56,771-1.

[10] See Chapter 3 of this Toolkit.

[11] Chapter 4 of this Toolkit; see also Poto, M. P., Kuhn, A., Tsiouvalas, A., Hodgson, K. K., Treffenfeldt, M. V., & M. Beitl, C. (2022). Knowledge integration and good marine governance: A multidisciplinary analysis and critical synopsis. *Human Ecology, 50*(1), 125–139. https://doi.org/10.1007/s10745-021-00289-y; Lohse, E. J., & Poto, M. P. (2023). *Coproduction of knowledge in climate governance*, Berliner Wissenschafts-Verlag, ISBN 978-3-8305-5538-4.

2.2   *The Objective Component of Co-creation: Transdisciplinarity*

Transdisciplinarity represents the most advanced stage of disciplinary interaction, which comprises and elaborates on the inter- and cross-disciplinary approaches by co-creating different forms of knowledge.[12] In this sense, it serves as a critical objective component in a co-created methodology for sustainability research, building upon what we defined as the subjective component of multiple actors' involvement.[13] This approach facilitates the empowerment of diverse actors, enabling the connection and development of academic, non-academic, and experiential knowledge systems through what is referred to in scholarly literature as the spiral of co-creation.[14]

This spiral unfolds through five stages: (1) the collective articulation of the problem and the project or initiative's objectives; (2) the integration of natural and social sciences facilitated by academic actors; (3) the incorporation of knowledge from non-academic actors such as Indigenous peoples and local communities; (4) a process of social learning and collective reflection on the objectives; and (5) the initiation of collective action for implementation. Furthermore, scholarship on transdisciplinary methodologies in co-creation for sustainability highlights that transdisciplinary research brings together diverse actors and epistemologies and fosters the co-creation of new forms of knowledge, including transformational, target, and systems knowledge.[15]

The systems knowledge created through the avenue of transdisciplinarity is of particular significance since an entirely siloed and linear

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[12] Pohl, C., Klein, J. T., Hoffmann, S., Mitchell, C., & Fam, D. (2021). Conceptualising transdisciplinary integration as a multidimensional interactive process. *Environmental Science & Policy, 118*, 18–26.

[13] Jacobi, J., Llanque, A., Mukhovi, S. M., Birachi, E., von Groote, P., Eschen, R., … & Robledo-Abad, C. (2022). Transdisciplinary co-creation increases the utilization of knowledge from sustainable development research. *Environmental Science & Policy, 129*, 107–115.

[14] Jacobi, J., Llanque, A., Mukhovi, S. M., Birachi, E., von Groote, P., Eschen, R., … & Robledo-Abad, C. (2022). Transdisciplinary co-creation increases the utilization of knowledge from sustainable development research. *Environmental Science & Policy, 129*, 107–115.

[15] Jacobi, J., Llanque, A., Mukhovi, S. M., Birachi, E., von Groote, P., Eschen, R., … & Robledo-Abad, C. (2022). Transdisciplinary co-creation increases the utilization of knowledge from sustainable development research. *Environmental Science & Policy, 129*, 107–115.

understanding of knowledge utilization is not sufficient. That's because such understanding neither addresses the intricacies of the systems being researched nor the diversity of development pathways that such research can favour when taking inclusive and participatory approaches.[16] Therefore, systems knowledge steps beyond the boundaries of identity, e.g. gender, race, ethnicity, class, etc., and centres on inclusive and holistic problem-solving frameworks.[17] This knowledge complements and enhances each stage of the spiral of co-creation in sustainability research, particularly when applied to ocean literacy and sustainability projects. Systems knowledge, with its focus on interconnectedness, feedback loops, and not only existing but also emergent elements, offers a methodology that can help integrate and operationalize the co-creation of knowledge across academic, non-academic, and experiential knowledge systems.

In the first stage, systems knowledge is pivotal in helping stakeholders frame the ocean sustainability problem holistically. Through systems mapping, actors can visualize how different components of the ocean system—such as marine ecosystems, human communities, applicable legal frameworks, and economic activities—interact with one another. This encourages participants to shift from a linear understanding of problems to one that acknowledges the complexity and interdependency of issues related to the ocean.[18] Systems thinking also fosters the identification of key leverage points where small interventions can yield significant

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[16] Jacobi, J., Llanque, A., Bieri, S., Birachi, E., Cochard, R., Chauvin, N. D., Diebold, C., Eschen, R., Frossard, E., Guillaume, T., Jaquet, S., K¨ampfen, F., Kenis, M., Kiba, D. I., Komarudin, H., Madrazo, J., Manoli, G., Mukhovi, S. M., Nguyen, V. T. H., Pomal'egni, C., Rüegger, S., Schneider, F., TriDung, N., von Groote, P., Winkler, M. S., Zaehringer, J. G., & Robledo-Abad, C. (2020). Utilization of research knowledge in sustainable development pathways: Insights from a transdisciplinary research-for-development programme. *Environmental Science & Policy, 103*, 21–29. https://doi.org/10.1016/j.envsci.2019.10.003.

[17] Jacobi, J., et al. (2022). Transdisciplinary co-creation increases the utilization of knowledge from sustainable development research. *Environmental Science & Policy, 129*, 107–115; Alvargonzález, D. (2011). Multidisciplinarity, interdisciplinarity, transdisciplinarity, and the sciences. *International Studies in the Philosophy of Science, 25*(4), 387–403. https://doi.org/10.1080/02698595.2011.623366; Nicolescu, B. (2014). Methodology of transdisciplinarity. *World Futures, 70*(3–4), 186–199. https://doi.org/10.1080/02604027.2014.934631.

[18] Jacobi, J., et al., 2020. Ibid.; Landry, R., Amara, N., & Lamari, M. (2001). Climbing the ladder of research utilization: Evidence from social science research. Science *Communication, 22*(4), 396–422. https://doi.org/10.1177/1075547001022004003.

change. By including diverse actors early in the articulation process, participants can jointly explore how various factors, from overfishing to climate change, interact to affect the ocean's health, thus enabling a more inclusive and nuanced understanding of the problem.[19]

In stage 2, where integration of natural and social sciences facilitated by academic actors often poses challenges due to the assumption that natural and social sciences have different ontologies and epistemologies, systems thinking and knowledge can serve as a bridge between these fields, providing a shared language of systems, feedback loops, and causal connections. For example, marine biology and economics might use system dynamics models to explore how ecological changes impact social and economic systems, creating common ground for interdisciplinary collaboration. In the context of this project, such integration is crucial for addressing ocean literacy, as it allows scientific insights (e.g. from marine biology) to be contextualized within social systems (e.g. human behaviours and governance). As a result, systems knowledge helps to ensure that natural and social sciences inform one another in the co-creation of actionable knowledge, through facilitating dialogue between disciplines.[20]

In stage 3, where the incorporation of non-academic knowledge, especially from Indigenous peoples and local communities, is involved, systems knowledge forms the cornerstone of transdisciplinarity. It is beneficial in this context because it values multiple perspectives and emphasizes the importance of, and builds upon, feedback mechanisms, which resonate with Indigenous epistemologies or "ways of knowing" that view nature and society as deeply interconnected.[21] Non-academic actors can use systems knowledge tools such as causal loop diagrams to express their understanding of ocean systems, particularly the relational dynamics they have developed over centuries of engagement with the ocean. For instance, Indigenous knowledge of sustainable fishing practices can be integrated into broader systems maps that include scientific data on fish populations, helping to create a more holistic understanding of ocean

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[19] See Chapter 1 of this Toolkit.

[20] See Chapter 1 of this Toolkit.

[21] Olsvig, S., & Cullen, M. (2024). Arctic indigenous peoples and international law. *Nordic Journal of International Law*, *93*(1), 152–169. https://doi.org/10.1163/15718107-bja10079.

sustainability.[22] Therefore, while systems knowledge positions Indigenous knowledge as critical to understanding and managing ocean systems, it helps elevate these perspectives, ensuring they are not marginalized in the knowledge co-creation process.

In stage 4, where the stakes are social learning and collective reflection on objectives, systems knowledge offers support by fostering ongoing reflection through the iterative social learning process. In systems knowledge, learning is viewed as a continuous feedback process, where stakeholders reflect on the outcomes of their actions, adapt their approaches, and refine their understanding of the system. This aligns well with the transdisciplinary spiral of co-creation, as it requires collective reflection and adaptability.[23] In the context of ocean literacy, this reflection can involve stakeholders assessing how their knowledge—scientific, experiential, and Indigenous—has influenced the co-creation process and shaped their collective understanding of ocean systems. As they engage in this social learning, participants may discover previously unseen connections or overlooked system components, which can lead to new objectives or strategies for action. Systems knowledge tools such as system archetypes (recurring patterns in systems) can help stakeholders recognize and address systemic issues, such as the "tragedy of the commons" in fisheries,[24] and encourage collective reflection on how to overcome these challenges.[25]

In the final stage on initiating collective action for implementation, systems knowledge provides a roadmap for translating co-created knowledge into action. This is done by identifying leverage points and critical feedback loops within the ocean system, which enables stakeholders to design interventions that are more likely to lead to systemic change.

[22] Obiero, K. O., Mboya, J. B., Ouko, K. O., Kembenya, E. M., Nyauchi, E. A., Munguti, J. M. et al. (2023). The role of indigenous knowledge in fisheries resource management for aquaculture development: A case study of the Kenyan Lake Victoria Region. *Aquaculture, Fish and Fisheries, 3*, 175–183. https://doi.org/10.1002/aff2.101.

[23] Jacobi, J., et al., 2020. Ibid.

[24] See, for instance, McWhinnie, S. F. (2009). The tragedy of the commons in international fisheries: An empirical examination. *Journal of Environmental Economics and Management, 57*(3), 321–333. https://doi.org/10.1016/j.jeem.2008.07.008.

[25] McLean, S., Read, G. J. M., Hulme, A., Dodd, K., Gorman, A. D., Solomon, C., & Salmon, P. M. (2019). Beyond the tip of the iceberg: Using systems archetypes to understand common and recurring issues in sports coaching. *Frontiers in Sports and Active Living, 1*, 49. https://doi.org/10.3389/fspor.2019.00049.

Systems knowledge encourages stakeholders to focus on interventions that address the root causes of problems rather than merely treating symptoms. For instance, an initiative to promote ocean literacy may use systems knowledge to identify key actors who can drive change—such as educators, policymakers, and community leaders—and engage them in a coordinated effort to shift public perceptions of the ocean. In so doing, strategies need to be devised to amplify the impact of those interventions in which different actors influence the system. Moreover, systems knowledge supports adaptive management, where stakeholders continuously monitor the effects of their actions and adjust as needed.[26] This is particularly relevant in ocean sustainability, where environmental conditions constantly change, and interventions must be flexible and responsive.

2.3   The Two Components in the Work of the OIN Team and the OIN Living Laboratory

In applying this analytical framework to the OIN team and its prototypical system of co-creation of the Living Laboratory,[27] we observe quite an accurate application of the two mentioned elements (subjective and objective components of co-creation) to the implementation of the ocean literacy vision. The team members worked together in the space of the network (the Ocean Incubator Network) which in many ways constituted the institutional framework where the members collaboratively searched for solutions that could respond to the central tenet of ocean literacy.[28]

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[26] Thelen, J., Sant Fruchtman, C., Bilal, M., et al. (2023). Development of the systems thinking for health actions framework: A literature review and a case study. *BMJ Global Health,* 8, e010191. https://doi.org/10.1136/bmjgh-2022-010191.

[27] Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

[28] Co-led by the Faculty of Law UiT The Arctic University of Norway and the Department of Geosciences and realized by the project developer and knowledge translator Laura Vita, the project engages a multitude of UArctic institutional partners, including UiT The Arctic University of Norway, the Arctic Centre at the University of Lapland in Rovaniemi, Finland, the James Hutton Institute and the University of Edinburgh in Scotland, the Centre for the Ocean and Society at Kiel University, Women of the Arctic in Finland, and the Marine & Environmental Law Institute at the Schulich School of Law, Dalhousie University. Additionally, it brings together a diverse group of researchers,

Such a framework was built following the rules of group formation, combining, adapting, and implementing the theoretical approaches of Bruce W. Tuckman[29] and Graham Gibbs.[30]

Within the established organizational framework from the project's inception, we ensured the involvement of all parties at every stage, from the co-creation of the project proposal (development phase) to the monthly meetings[31] and ultimately to the final Living Laboratory event focused on dissemination and maintenance.[32] Within this polycentric governance structure, project and group leaders served as project coordinators, developers, and group facilitators. This leadership structure facilitated the integration of various perspectives and the smooth progression of project phases,[33] by explicitly implementing SDG 5, focusing on

students, and experts in global health, youth participation and climate justice, environmental law, food justice, and ecolinguistics (Cork University College, The University of Exeter, The Thalassophile Project, the University of Turin, Mariupol State University). More on the institutional structure of the network in the scientific report of the Living Laboratory: Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

[29] Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin, 63*(6), 384.

[30] See Chapter 1, section 1.8. Gibbs, G. (1988) *Learning in doing: A guide to teaching and learning methods*, Oxford Centre for Staff and Learning Development, Oxford Polytechnic, London; Gibbs, G. (1998). *Learning by doing: A guide to teaching and learning.* Brookes Oxford University, London; Gibbs' reflective cycle. (2016). *Academic services & retention team*, University of Cumbria; https://my.cumbria.ac.uk/media/MyCumbria/Documents/ReflectiveCycleGibbs.pdf, last access August 15, 2024.

[31] The Monthly Coffee Meetings, inspired by the World Café Method, were developed to provide a space for a structured conversational process intended to facilitate open and intimate discussion. It links ideas within a larger group to access "collective intelligence" of the participants and to understand and learn from multiple points of view. See Ravneberg, B. E. (2024, February). Co-creating and co-producing learning environments in adult education through the World Café method. *Frontiers in Education, 9*, 1335747. Frontiers Media SA. For a documentation of the OIN Team Monthly Coffee Meetings see https://en.uit.no/project/oceanincubator, last access, August 28, 2024.

[32] For documentation of all the initiatives undertaken by the OIN team members see https://en.uit.no/project/oceanincubator, last access, August 21, 2024.

[33] On this model of leadership see also the Chapter 2.

women's leadership. This perspective emphasized the values of relationality, compassion, and care,[34] which were integrated into various facets of the research subject and influenced the selection of relational group dynamics.

Team members assumed dynamic roles as knowledge translators, learners, and facilitators, actively engaging in every facet of the project.[35] This engagement spanned from the initial project conception to the planning and development phases, the testing of the Living Laboratory prototype, the creation of activities, and the consolidation of research findings in co-authored chapters.

This comprehensive involvement ensured that all team members were contributors, co-learners, and co-creators, embodying the principles of co-creation throughout the project lifecycle. This approach fostered a collaborative environment where knowledge was not only shared but also generated collectively, leading to a richer, more integrated outcome that reflected all participants' diverse inputs and expertise (Figs. 3 and 4).[36]

2.4   The Objective Component of Co-creation

In our OIN team, we adhered to the objective component of co-creation by embedding transdisciplinarity throughout all stages of our project development. This comprehensive approach encompassed a wide range of

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[34] See Chapter 6.

[35] For some examples of the role of the OIN team members at the inception of the project see Panieri, G., Poto, M. P., Bertella, G., Bertolotto Bianc, G., Médici, N., Murray, E. M., Pandeva, R., & Vita, L. (2023). Ocean Interconnectedness: An interdisciplinary workshop to learn from the ocean, through multisensory activities and reflections on the role of emotions in science and law: Senses & Science, Love & Law. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7271. For their role during the implementation of the Living Laboratory see Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

[36] On the importance of developing a structured system of feedback see Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

Fig. 3   Reflective practice exercise by the sea at the conclusion of the Living Laboratory, Copenhagen, May 2024 (*Photo* Igor Peftiyev)

knowledge systems: (a) academic disciplines, (b) non-academic disciplines, and (c) experiential knowledge (Figs. 5 and 6).

(a) Academic Disciplines: We drew on expertise from diverse fields, including marine geosciences, law education, global health, political sciences, gender studies, and ecolinguistics. This interdisciplinary academic collaboration enriched our understanding and approach to the complex issues at hand.

(b) Non-Academic Disciplines: With the invaluable assistance of Indigenous scholars, our project embraced perspectives rooted in Arctic Indigenous knowledge, specifically referencing the works of Harald Gaski[37] and in collaboration with Aila Biret Henriksen

[37] Gaski, H. (2019). Indigenous elders' perspective and position. *Scandinavian Studies*, *91*(12), 259–268.

Fig. 4 Circle of Gratitude exercise with OIN Team members (*Photo* Igor Peftiyev)

Selfors.[38] Moreover, we developed follow-up activities on ocean literacy in collaboration with the Indigenous peoples from the Aldeia Maraka'nà in Rio de Janeiro (June 2024).[39] There, our OIN team members, in collaboration with Indigenous experts, developed a follow-up workshop where Indigenous knowledge and one

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[38] Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

[39] On the history of the Aldeia Maraka'nà and its relationship to water see Médici, N. (2024). Indigenous resilience through the waters: The story of the Aldeia Maraka'nà, https://blogs.egu.eu/geolog/2024/08/19/indigenous-resilience-through-the-waters-the-story-of-the-aldeia-marakana/, last access August 28, 2024; Médici Machado, N. C., Poto, M. P., & Murray, E. M. (2024). The paths of water and their relations: A dialogue between Brazil and Norway, in Panieri G., Poto, M. P., & Murray E. M. (eds). (2023). *Emotional and ecological literacy for a more sustainable society*, Springer Nature SDGs Series, ISBN: 978-3-031-56771-1.

Fig. 5 Foraminifera box and materials during the workshop on experiential knowledge in ocean literacy at the Aldeia Maraka'nà, in Rio de Janeiro (*Photo* Ana Maria Montaña Monoga)

of the co-created activities developed during the Living Laboratory were shared with children, elders, researchers, and other community members. This inclusion ensured that Indigenous and local insights were integral to our methodology, providing depth and context beyond conventional academic frameworks.[40]

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[40] Montaña Mónoga, A. M., Parola, G., Poto, M. P., Panieri, G., Muniz de Souza (Otomorinhori'õ Xavante), J., Médici Machado, N., Wennerstrom, A., Barrenechea Angeles, I., & Zimmermann, J. (2024). ECO_CARE Multisensory and Experimental Workshop 2024 "We are the Ocean, and the Ocean is us. A Living Laboratory to learn from each other and learn from the ocean". *Septentrio Reports*, (1). https://doi.org/10.7557/7.7828.

Fig. 6 Ocean literacy co-created activity with the Aldeia Maraka'nà, in Rio de Janeiro (*Photo* Ana Maria Montaña Monoga)

(c) Experiential Knowledge: Our project actively incorporated experiential knowledge through reflective practices[41] and outreach educational activities. In particular, among these activities, it is worth mentioning the workshop organized in June 2024 at the Aldeia Maraka'nà in Rio de Janeiro and the activities of the foraminifera box with local school Goyavier in Colombia, which

[41] Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606. Our reflective practice was largely inspired by Gibbs, G. (1988). *Learning by doing: A guide to teaching and learning methods*. Further Education Unit. Oxford Polytechnic: Oxford. The whole Living Laboratory experience built on the experience developed through emotional and experiential education: Panieri, G., Poto, M. P., & Murray, E. M. (eds.). (2024). *Emotional and ecological literacy for a more sustainable society*, Palgrave Macmillan, Springer Nature, ISBN: 978-3-031-56771-1.

facilitated a hands-on learning experience that was both immersive and enlightening.[42]

By integrating these diverse forms of knowledge, the team fully embraced transdisciplinarity, engaging in collaboration across academic and non-academic disciplines, and enhancing their experience through experiential learning. This approach fostered a richer, more comprehensive understanding of the issues we addressed, highlighting the value of combining academic, non-academic, and experiential knowledge in co-creative processes for ocean literacy.

3   Connection to the Two Pathways

Our commitment to pursuing co-creation, in alignment with the dual pathways of connecting with each other and connecting with the ocean,[43] is evident in numerous aspects and steps of our project, particularly through the subjective and objective components. For example, as explained above, to connect with each other, we designed our institutional space, developing a system of Monthly Coffee Meetings inspired by the World Café methods, to facilitate interaction and collaboration, ensuring it is conducive to co-creation. This environment supported open dialogue through online and in-person meetings and the sharing of diverse perspectives, which are crucial for nurturing solid connections among team members, stakeholders, and communities.

Moreover, another tangible example of how we fostered a sense of connection among our OIN team members was by creating working stations in our Living Laboratory as prototypes of the three thematic chapters in this Toolkit. The stations, defined by illustrated posters printed on fabric designed by our project illustrator, Valentina Russo, were referred to as "hubs". We encouraged each working group to convene

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[42] For the latter see https://en.uit.no/project/ecocare/nyheter/artikkel?sub_id= 848392, last access August 21, 2024; for both see Montaña Mónoga, A. M., Parola, G., Poto, M. P., Panieri, G., Muniz de Souza (Otomorinhori'õ Xavante), J., Médici Machado, N., Wennerstrom, A., Barrenechea Angeles, I., & Zimmermann, J. (2024). ECO_CARE Multisensory and Experimental Workshop 2024 "We are the Ocean, and the Ocean is us. A Living Laboratory to learn from each other and learn from the ocean". *Septentrio Reports*, (1). https://doi.org/10.7557/7.7828.

[43] See more on this in Chapter 1 and throughout the different Chapters 2–4.

around these hubs, utilizing them as vision boards for displaying the outcomes of their efforts and as focal points for cultivating a sense of community centred around a shared thematic focus (namely: positionality, inter-cross-transdisciplinarity, and co-creation) (Figs. 7 and 8).

Moreover, we have been mindful to keep our ocean connection open constantly. Adopting a multisensory approach, we immersed participants in experiences emphasizing sensory interactions with the ocean. This included encouraging them to craft positionality statements related to the ocean, engaging them in reflective practices linked to ocean experiences, and organizing a "sound bathing experience" where we listened to music inspired by the ocean. In particular, at the beginning of the Living Laboratory, the participants were encouraged to connect with the Arctic story

Fig. 7   Cover of co-creation developed to create a working space during the Living Laboratory (*Illustration* Valentina Russo)
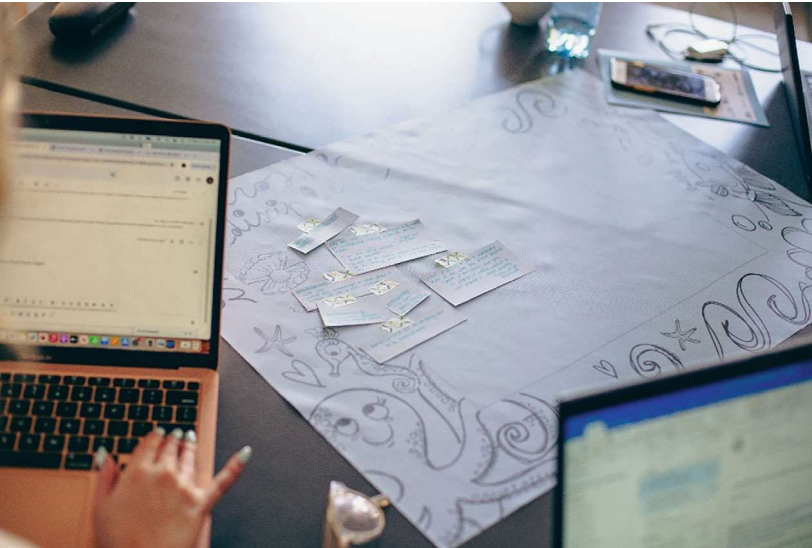
Fig. 8 Example of the working hub inter-cross-transdisciplinarity that helped the team members connect with each other (*Photo* Igor Peftiyev)

by listening to the heartbeat from our sea heart.[44] In addition, at the end of the first presentation round, the team was immersed in listening to two ocean-related auditory experiences. The first was a soundtrack composed by Giuliano Bertolotto Bianc from the University of Turin, celebrating

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[44] In the animation created by Artem Krykhtenko and illustrated by Valentina Russo: https://youtu.be/TOAY88Znx-8, last access August 22, 2024. Other examples of multi-sensory experiences developed to connect with the ocean can be found in the Living Laboratory report and in the kick-off meeting where a morning concert with the theme "Ocean Interconnectedness" was organized in collaboration with the Music Conservatory at UiT The Arctic University of Norway. Respectively: Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606; Panieri, G., Poto, M. P., Bertella, G., Bertolotto Bianc, G., Médici, N., Murray, E. M., Pandeva, R., & Vita, L. (2023). Ocean interconnectedness: An interdisciplinary workshop to learn from the ocean, through multisensory activities and reflections on the role of emotions in science and law: Senses & Science, Love & Law. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7271.

the discovery of the volcano Borealis during the Akma Expedition in 2023 by Giuliana Panieri.[45] The premiere of the recording was featured on the occasion of the Ocean Incubator Network kick-off meeting in September 2023. The second auditory and visual experience consisted of watching the documentary "Blue Mind",[46] which showcased Rada Pandeva's (one of our OIN team members) profound connection with the ocean (Fig. 9).

These reflections prompt us to consider how interconnected we are with the ocean and how our actions impact this vital ecosystem. Furthermore, the outcomes of our co-creation efforts are designed to deepen our understanding and help us and our target audience re-establish and

Fig. 9   A space for a multisensory experience: hearing an Arctic Indigenous story, connecting with the ocean through our heartbeats (*Photo* Igor Peftiyev)

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[45] A live version of the music piece is available on the ECOCARE youtube channel at the link https://youtu.be/J3I3ypiuV4Q?si=fH_xVG4WGhhDV8mC (up to minute 4.29), last access August 28, 2024.

[46] BLUE MIND—Short Documentary (RED Komodo + DZO Vespid Primes), director Alexandra Karadzhova, available at https://youtu.be/_JrMcj1NuiI?si=luQKzO0l9 UbNkNwK, last access August 28, 2024.

strengthen our connection with the ocean. This approach ensures that our project resonates on a personal level, making the importance of ocean conservation and literacy more tangible and immediate.

By integrating these strategies into our project, we ensure that every aspect of our work aligns with and supports the pathways of connecting with each other and with the ocean. This holistic approach amplifies the impact of our efforts, making our project a powerful catalyst for change in ocean literacy and conservation.

4   Guidelines for Effective Co-creation in Ocean Literacy: A Summary from the Living Laboratory Workshop

The Living Laboratory workshop provided a structured set of guidelines designed to steer the development of activities aimed at effectively communicating the importance and applicability of co-creation in the context of ocean literacy.[47] These guidelines not only served as a roadmap for the Living Laboratory participants but also stand as valuable principles for future endeavours in similar subject matters. Here's a comprehensive summary of the guidelines discussed:

(a) Purpose and Objectives:
The primary step involves clearly defining the specific goals of the co-creation project. Participants were encouraged to consider how co-creation could enhance the outcomes or the quality of the end result, ensuring that the objectives align with the overarching aim of promoting ocean literacy.

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[47] The guidelines were developed during online meetings and subsequently distributed among the thematic groups via Teams. Throughout the Living Laboratory, thematic booklets containing detailed instructions and step-by-step processes were provided to participants to aid in the development of their thematic projects. See more on this in Chapter 1 and in Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

(b) Stakeholder Identification:

Identifying key stakeholders is crucial. The guidelines emphasized understanding the perspectives, expertise, and interests of these stakeholders to ensure their contributions effectively support the co-creation process.

(c) Collaborative Framework:

A robust methodology or framework that facilitates effective collaboration among participants is vital. The workshop highlighted the importance of ensuring equitable participation and decision-making, which are foundational for successful co-creation.

(d) Resource Allocation:

Discussing the allocation of necessary financial, human, and technological resources was pointed out as essential for supporting the co-creation efforts. Efficient resource management maximizes the benefits derived from co-creation.

(e) Communication and Feedback:

Establishing and maintaining open communication channels among all participants ensures transparency and continuous engagement. Implementing mechanisms to gather and incorporate feedback throughout the process helps refine and improve the co-creation activities.

(f) Roles and Responsibilities:

Clarity regarding each participant's roles and responsibilities is imperative. The guidelines stressed accountability and clear communication to avoid overlaps and ensure that all tasks are covered effectively.

(g) Flexibility and Adaptability:

Adapting to changes and responding to uncertainties and challenges is crucial in a dynamic co-creation environment. Strategies to enhance adaptability and resilience among participants were discussed as essential components.

(h) Ethical Considerations:

Ethical principles must guide the co-creation process. Ensuring that diverse perspectives and voices are respected and valued is fundamental to the integrity and inclusiveness of the project.

(i) Evaluation and Reflection:
   Evaluating the effectiveness and impact of the co-creation exercise is critical for understanding its success and areas for improvement. Opportunities for participants to reflect on their experiences and lessons learned contribute to personal and collective growth.
(j) Long-Term Sustainability:
   Finally, promoting sustainability and continuity beyond the immediate scope of the project ensures that the benefits of co-creation extend into the future. Measures to foster long-term collaboration and innovation among participants were considered essential for ongoing impact.

These guidelines facilitated activities during the Living Laboratory and provided a structured approach that can be replicated in future projects focused on ocean literacy and beyond. By adhering to these principles, future endeavours can achieve more structured, inclusive, and effective outcomes in the field of co-creation.

5   Examples of Co-created Activities

In the other thematic chapters, we have showcased one example of a co-created activity for each theme. However, in the context of co-creation, it is clear that every activity developed by the OIN Team—before, during, and after the Living Laboratory—serves as an example of knowledge co-creation for ocean literacy. Therefore, in this section, after presenting the outcomes from the co-creation group, we will highlight the most exemplary instance of co-creation in ocean literacy, drawing from the collective experiences of the entire OIN Team.

5.1   Co-creation in Ocean Literacy: Preliminary Ideas Developed During the Living Laboratory

The co-creation group's efforts during the Living Laboratory led to the development of three clear, prototypical ideas for enhancing ocean literacy through co-creation:

(a) Co-creation of an Ocean Literacy Video Game:

The group explored developing a video game centred on ocean literacy. In this game, players would co-create their strategies to achieve a deeper understanding of ocean-related issues.[48] This interactive approach allows participants to engage actively with the content, fostering a personal connection to ocean literacy through collaborative problem-solving and strategy development.

(b) Ecolinguistics-Inspired Activities:

Drawing inspiration from the book "The Concept of Water" by Rupert D. Glasgow,[49] the group reflected on the diverse cultural representations of water. This reflection led to the idea of using storytelling or other creative methods to give water a central role in educational activities. By exploring how different cultures and communities articulate their relationship with water, rivers, seas, and oceans through proverbs, sayings, and idioms, these activities aim to enrich participants' understanding of the symbolic and philosophical significance of water.[50]

(c) Critical Discourse Analysis for Ocean Literacy:

The group proposed using critical discourse analysis as a foundational step in developing resources for ocean literacy. This approach ensures that all co-creation participants have a common understanding and that the foundational documents are thoroughly analysed for complexity.[51] By critically evaluating information, individuals can make informed decisions about

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[48] Poto, M. P., Vita, L., Brown, K., Hayden-Nygren, J., Heinrich, K., Hernández Ant, A., Kuhn, A., Montaña Monoga, A. M., Murray, E. M., Pandeva, R., Panieri, G., Parry, S., Peftieva, O., Prior, T., & Quist, S. E. (2024). The Ocean Incubator Network (OIN) living laboratory and ocean literacy toolkit. *Septentrio Reports*, (1). https://doi.org/10.7557/7.7606.

[49] Glasgow, R. D. (2009). *The concept of water*, RDV Glasgow.

[50] Glasgow, R. D. (2009). *The concept of water*, RDV Glasgow.

[51] For critical discourse analysis in ecological literacy see Haig, E. (2001). A study of the application of critical discourse analysis to ecolinguistics and the teaching of eco-literacy. *Studies in Language and Culture* (Nagoya University, Faculty of Language and Culture), *22*(2), 205–226.

ocean-related policies and practices, enhancing their advocacy for sustainable ocean practices.[52] This method not only raises awareness but also empowers participants to advocate effectively for positive changes at local, national, and global levels.

These ideas collectively aim to deepen engagement with ocean literacy through innovative, interactive, and reflective methods, ensuring that participants learn about and actively contribute to the discourse on ocean conservation.

5.2   An Example of Co-created Activity for Ocean Literacy Through Critical Discourse Analysis

In the work completed by Olena Peftieva, a co-creation group member, reflecting after the Living Laboratory, the author further explored how a critical discourse analysis for Ocean Literacy could be laid out as an activity to enhance engagement with ocean-related texts and use analytical skills to promote ocean literacy.

A critical reading approach to reading documents, reports, or research is not about being sceptical or negative; it rather triggers creativity and curiosity.[53] Critical reading helps identify ambiguities, contradictions, or misleading statements to avoid miscommunicating information to others.[54] Using the skill of critical reading to analyse a text with a group of students from different educational settings opens the opportunity for co-creating new knowledge by combining the perspectives brought by the participants.

By bringing together diverse perspectives from disciplines such as philology, logic, lexicology, language studies, and critical thinking, we can nourish a rich and dynamic environment for co-creation. Philology with its focus on the historical development of languages and texts can

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[52] Ghorbanpour, A., & Davari, H. (2024). Promoting ecoliteracy through communication: How language can shape our relationship with the more-than-human world: Ecological communication and ecoliteracy: Discourses of awareness and action for the lifescape, in Bortoluzzi, M., & Zurru, E. (eds.), Bloomsbury, London, 288 p. (hardback), ISBN 9781350335820.

[53] Lucas, B., & Spencer, E. (2017). *Teaching creative thinking: Developing learners who generate ideas and can think critically* (Pedagogy for a Changing World series). Crown House Publishing Ltd.

[54] Manarin, K., Carey, M., Rathburn, M., & Ryland, G. (2015). *Critical reading in higher education: Academic goals and social engagement*. Indiana University Press.

provide a deep understanding of the context and background of the text that is analysed. Logic can help identify and analyse the underlying arguments and reasoning. Lexicology can offer insights into the meaning and usage of specific terms and concepts, while language studies can provide a broader understanding of linguistic structures and patterns. Finally, critical thinking can equip us with the tools to evaluate the validity and reliability of the information presented and identify the target audience of the information.

When these disciplines are combined in a group setting, the process of co-creation becomes even more powerful. By sharing their expertise and insights, participants can challenge each other's assumptions, identify blind spots, and generate new ideas. This collaborative and multi-disciplinary approach not only leads to an enhanced understanding of the material but also helps to develop critical thinking skills and a sense of intellectual curiosity.

Through this co-creative process, the group can not only develop new methodologies for critical reading (by creating a unique combination of different disciplines) but also gain a more comprehensive understanding of the information being analysed. By applying the tools and perspectives from different disciplines, participants can identify hidden meanings, uncover underlying assumptions, identify bias, and evaluate the credibility of the source material. This, in turn, allows them to clearly articulate their own interpretations and insights, contributing to a more informed understanding of the text.

Here is the description of an activity that could help students reflect on the possibilities of legal texts and documents critically and eventually suggest a co-created new interpretative content to the text. The activity description is followed by Appendix A, with a more complete list of some possible examples of linguistic elements to review prior to conducting the critical reading activity.

To conclude, it is worth noting that all the activities developed by the three working groups during the Living Laboratory, as well as those identified, mapped, and shared by the extended Ocean Incubator Network Team at a later stage, can be found in Chapter 8 in this book, and all are enumerated as outputs of co-creation useful for ocean literacy.

Activity Name: Ocean Literacy, Ecolinguistics & A Critical Lens

Target Audience: Bachelor-level Students (preferably from many different academic disciplines).

Learning Objectives: This activity aims to foster a deep understanding of marine issues, identify biases, integrate interdisciplinary knowledge, promote critical thinking, and empower advocacy. By scrutinizing the sources and evidence presented in documents, we can assess the credibility and reliability of the information. Critical reading and appraisal are essential skills for distinguishing between scientifically sound data and misinformation. Developing these skills is imperative for creating a more informed and engaged society that effectively addresses our oceans' challenges.[55]

Materials Needed: A public access document related to ocean protection or water governance—paper copy of the document, pens/pencils, and highlighters.

*For contextual applicability, having the document from the region/province/state/country where this activity is being run is best. For example, if you were running this activity in Canada, you could choose to critically read Canada's Oceans Protection Plan.

*The activity can be completed digitally by having an online version of the document, and participants can type notes and highlight the document on their computer/tablet/phone.

Guidance to complete activity:

1. Gather the students and provide them with a copy of the document you are reviewing. Instruct the students to read through the document to familiarize themselves with its content, and allow them time to review and consider it from their perspective. They are encouraged to take notes or comment on their document copy.
2. Once the students have completed their reading time, reorient them and commence a short discussion, with students sharing their initial impressions of the text and its contents.
3. Complete a short review of essential linguistic and critical reading elements to be aware of while reading the document.

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[55] Kelly, R., Evans, K., Alexander, K. et al. (2022). Connecting to the oceans: Supporting ocean literacy and public engagement. *Reviews in Fish Biology and Fisheries*, *32*, 123–143. https://doi.org/10.1007/s11160-020-09625-9.

4. Have students re-read the document using the elements they just reviewed as a reminder to apply a critical lens to what they are reading. Again, encourage them to make notes on their copy of the document to aid them in the next discussion.

5. Re-orient students once they have completed the second reading and commence a discussion of their new findings and thoughts on the document. Encourage each student to share their perspective so that a variety of information is shared, and encourage them to identify any underlying biases or assumptions they may have brought to the text based on their educational background.

6. Have the students share their results in smaller groups, then try to develop a short summary, re-writing the text and applying a co-created and collaborative approach.

Additional information: Below is an example of one linguistic element that could be reviewed during step 3. For additional examples, please refer to Appendix A; facilitators running this activity should include additional elements relevant to their field of study and the context where the activity is being run.

Framing	Refers to how the content of a text is presented and what sort of perspective (angle, slant) the writer is taking
Foregrounding	Foregrounding is generally used to highlight important parts of a text, aid memorability, and refer to specific linguistic devices, i.e. deviation and parallelism, that are used to give special prominence to certain information

* * *

APPENDIX

Examples of linguistic elements to review prior to conducting the "critical reading" activity. Facilitators running this activity should include additional elements relevant to their field of study and the context of the activity.

Framing	Refers to how the content of a text is presented and what sort of perspective (angle, slant) the writer is taking
Foregrounding	Foregrounding is generally used to highlight important parts of a text, aid memorability, and refer to specific linguistic devices, i.e. deviation and parallelism, that are used to give special prominence to certain information[56]
Omission	An omission, a manipulation of the text, occurs when information is deliberately left out or altered in a written or spoken communication. Omission of agents/does is a common form of manipulation at the sentence level. It occurs most often through nominalization and the use of passive verbs. If the author omits information, a reader cannot scrutinize it[57]
Presupposition	A presupposition is a piece of information that a writer assumes to be true or takes for granted as if there were no alternative. These assumptions serve as background knowledge for the author and the audience. Sometimes presuppositions arise from context and discourse expectations, sometimes they are encoded in specific words or phrases[58]
Agent-patient	Agent-patient (doer-recipient) relations on the syntax level can also be presented in a manipulative manner. An agent is the initiator of some action, and a patient is the entity undergoing the effect of some action. Many texts describe things so that a certain person is consistently depicted as initiating actions (agent/doer exerting power) while others are described as being (often passive) patient/recipient of those actions[59]
Register	Register refers to a document's level of formality or informality, its degree of technicality, its subject field, etc. Writers can deceive readers by affecting the register that induces a certain misplaced trust[60]

* * *

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