CHAPTER 6

The Ocean Senses Activity Book: Enriching Ocean Literacy Through a Multisensory Approach

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Abstract This chapter outlines the development of "The Ocean Senses Activity Book" integrating a multisensory approach to ocean education for pupils and the general public. Originating from an expedition in the

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Arctic Ocean, the project aimed to cultivate more effective cognitive approaches to ocean literacy education and communication. It bridged the gap between scientific exploration and public engagement, immersing learners in a multisensory, experiential educational experience. This innovative approach intended to enhance understanding and foster a deeper connection to ocean science, transcending traditional cognitive methodologies. The book's development is traced from the conceptualisation stage before and during the expedition, where scientists, educators, and creative professionals collaborated to design learning activities engaging the human senses. The development process involves interdisciplinary collaboration across multicultural and multilingual settings, ensuring an inclusive and immersive experience for diverse audiences.

Keywords Multisensory · Arctic Ocean · Education · Ocean literacy · Accessibility

1 Introduction

Ensuring accessibility in Ocean Literacy (hereinafter, OL)[1] involves making information, resources, and educational opportunities available to a diverse audience, including those with disabilities or limited access to teaching material and sources. In the context of OL, this could include providing alternative formats other than written content or relying on the use of extensive resources related to digital learning. In geoscience

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[1] UNESCO-IOC. (2021). *Ocean Literacy Framework for the UN Decade of Ocean Science for Sustainable development 2021–2030*. Paris: UNESCO (IOC Ocean Decade Series, 22).

research and academia, accessibility is promoted by open access to scientific publications and data and the FAIR principles.[2] Open access allows a broader audience, including researchers, educators, and the public, to access and use scientific information freely, and the FAIR (Findable, Accessible, Interoperable, and Reusable) principles outline a set of guidelines to enhance the usability and impact of digital resources in scientific research. By adopting both Open Access and FAIR principles, the scientific community can establish a more inclusive and collaborative research environment, ensuring that knowledge is free to access and presented in a structured and reusable format, promoting the advancement of science.

Nonetheless, ocean conservation needs to involve and engage diverse communities in addition to academia, like the general public, locals and Indigenous communities, non-profit and advocacy organisations, primary and secondary education, adult education, industry and business sectors, and communities in the arts and humanities, among others.[3,4] Involving diverse stakeholders ensures the longevity and effectiveness of conservation initiatives by fostering a culture of environmental stewardship.

This chapter will describe and discuss the development of learning activities that use the five human senses to immerse learners in a multisensory, experiential educational experience, included in The Ocean Senses Activity Book (OSAB).[5] The backdrop for the development of the book lies in the profound understanding that fostering a deeper connection to the ocean necessitates a departure from traditional cognitive methodologies. This co-created learning resource exemplifies the power of interdisciplinary collaboration, fostering a bridge between the intricate world of ocean science, the general public, and especially pupils. The activity book was developed during the AKMA2-Ocean Senses Research

[2] Wilkinson, M., Dumontier, M., Aalbersberg, I., et al. (2016). The FAIR guiding principles for scientific data management and stewardship. *Scientific Data, 3*, 160018. https://doi.org/10.1038/sdata.2016.18.

[3] Kelly, R. S., Mendham, D. S., & Pecl, G. T. (2018). Social licence for marine conservation science. *Frontiers in Marine Science*, 5. http://doi.org/10.3389/fmars.2018.00414.

[4] Kim, M., & Mason, D. P. (2018). Representation and diversity, advocacy, and nonprofit arts organizations. *Nonprofit and Voluntary Sector Quarterly, 47*(1), 49–71. http://doi.org/10.1177/0899764017728364.

[5] See further Chapter 1, as well as Sect. 3 of this chapter.

Expedition in May 2022,[6] which focused on expanding knowledge of extreme environments in the Arctic Deep Sea. The Expedition received endorsement from the UN Ocean Decade,[7] and a number of our objectives and goals aboard relate to the UN Sustainable Development Goals (SDGs)[8] which are calls to action for all countries to "*improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests*". The Ocean Senses Activity Book demonstrates the synergy achieved when scientists and scholars from diverse backgrounds join forces to foster improved science education and communication in Ocean Literacy, Marine Science, and Ocean Conservation (Fig. 1).

2 Background: The AKMA Project

The Ocean Senses Activity Book was developed during the AKMA2-Ocean Senses Research Expedition part of the AKMA project, Advancing Knowledge on Methane in the Arctic,[9] funded by the Norwegian Research Council. The scientific focus of the project was aimed at understanding the processes involved in methane formation and migration and the impacts of climate change, with a specific focus on the Arctic. Methane, a potent greenhouse gas, has the potential to accelerate global warming, and the Arctic's delicate ecosystems are particularly susceptible to its effects due to increased bottom and air temperature. The project's multidisciplinary approach combined cutting-edge research, technological innovation, and the development of new approaches and content for university students. In addition to its scientific advancement, AKMA embarked on a parallel mission of advancing ocean education through the development of educational initiatives involving school pupils, early career scientists, and artists, to improve OL. This is where The Ocean

[6] Panieri, G., & Stiller-Reeve, M. (Eds.). (2023). *The Ocean Senses Activity Book*. Septentrio Educational, 2023(1). https://doi.org/10.7557/se.2023.1.

[7] https://oceandecade.org/, last access 10 December 2023.

[8] https://sdgs.un.org/goals, last access 10 December 2023.

[9] For more details, see https://en.uit.no/project/akma/Akma2, last access 10 December 2023.

Fig. 1 "United by the AKMA project": The participants of the AKMA 2 Ocean Senses expedition aboard the RV Kronprins Haakon. The team of dedicated researchers and professionals set sail into the Arctic Ocean, embarking on a voyage of scientific discovery and development of new learning activities involving the human senses

Senses Activity Book comes into play, born from the collective efforts of marine geoscientists, educators, and social scientists.[10]

[10] Panieri, G., & Stiller-Reeve, M. (2023). Introduction. In G. Panieri & M. Stiller-Reeve (Eds.), *The Ocean Senses Activity Book* (pp. 7–8). Septentrio Educational, 2023(1). https://doi.org/10.7557/8.7046

3 The Ocean Senses Activity Book: Developments, Outputs, and Application to Multicultural Contexts

3.1 Developments

The development of The Ocean Senses Activity Book was grounded in the AKMA expedition being joined by a dynamic, international group of highly interdisciplinary scientists and students from diverse fields, including the marine geosciences, philosophy, psychology, gender studies, education, health sciences, and environmental law. The cruise leader assembled the team by selecting and coordinating project partners whose collective expertise aligned seamlessly with the expedition's primary goals and research expectations while, simultaneously, bringing a vastly different perspective to it, in addition to varied expertise on the human primary senses. Divided into five working groups, the teams worked to create educational resources to facilitate experiential learning through (1) sight, (2) taste, (3) touch, (4) smell, and (5) hearing. Each group paired marine scientists (e.g., biologists, geochemists, or geologists) with university students, science teachers, and participants with expertise or distinct interest in each respective sense (e.g., a musician joined the "hearing" group, a visual artist joined the "sight" group, a physical therapist for the group on "touch", etc.). This diverse composition ensured a multidisciplinary approach, drawing on varied disciplinary expertise, educators' pedagogical insights, and students' fresh perspectives in crafting educational initiatives that brought the wonders of the ocean to life. Every day, after the scientific operations, the groups met to create immersive experiences that would connect individuals with the ocean through multisensory learning activities. These experiences were additionally shared in a variety of blog posts created during each day of the cruise (Fig. 2).[11]

3.2 Outputs

The OSAB comprises sixteen interdisciplinary lesson plans and ideas that encourage and facilitate learning about the ocean and connecting to it via the human senses. The activities were developed to cater to a diverse

[11] https://en.uit.no/project/akma/Akma2, last access December 2023.

Fig. 2 "Engaging with the human sense": A triptych of dedication during the AKMA2 Ocean Senses cruise during which participants collaborated in developing the activities for The Ocean Senses Activity Book. In (a) and (c) the team was crafting and testing immersive experiences using the touch senses then resulted in the "Sculpting foraminifera" activity.[12] In (b) a scientist and a schoolteacher work together in developing an activity involving the taste sense[13]

audience: for teachers spanning the educational spectrum,[14] from kindergarten to high school; for parents that could engage their children in some of the activities; or even for older pupils to engage with younger pupils at school or science fairs.[15] But while certain senses seemed to lend themselves easily to developing engaging activities, others posed

[12] Maric, F., Poto, M. P., Zimmermann, H. J., & Panieri, G. (2023). Sculpting foraminifera. In G. Panieri & M. Stiller-Reeve (Eds.), *The Ocean Senses Activity Book* (pp. 91–93). Septentrio Educational, 2023(1). https://doi.org/10.7557/8.7060© The Author(s) CC BY 4.0.

[13] Mohadjer, S., Aune, V., Panieri, G., & Oddone, D. (2023). A journey to a cold seep. In G. Panieri & M. Stiller-Reeve (Eds.), *The Ocean Senses Activity Book* (pp. 53–69). Septentrio Educational, 2023(1). https://doi.org/10.7557/8.7053© The Author(s) CC BY 4.0.

[14] Mohadjer, S., Aune, V., Panieri, G., & Oddone, D. (2023). A journey to a cold seep: How scientists study methane in the Arctic ocean: A paired teaching lesson plan. *Septentrio Educational* (1), 53–69. https://doi.org/10.7557/8.7053.

[15] https://uit.no/tavla/artikkel/823967/forskningsdagene_i_sentrum.

more difficulties for the team members. Vision, the most relied-upon sense in traditional education, readily seemed to lend itself to developing engaging activities.[16] The vast oceanic landscapes, teeming with vibrant marine life, offer an expansive canvas for visual exploration. While initially challenging to capture, the auditory realm of the ocean becomes a compelling arena for learning with the right resources. Audio narratives,[17] interviews with marine experts,[18] and recordings of underwater soundscapes[19] offered useful elements for learners to engage with the symphony of the sea, but even the age-old device of song[20] finally proved a powerful tool for increasing teacher and student engagement and learning. The sense of touch lends itself naturally to tactile engagement with learning materials.[21,22,23,24] Hands-on models,[25] sculpturing,[26] and temperature changes provide learners with a tangible experience of the ocean, even when it is not directly at hand. This aspect of OL proved to be both intuitive and effective, making the tactile dimension the sense under which

[16] Os, V., Zimmermann, H. J., & Panieri, G. (2023). Exploring the Arctic deep-sea by color filters. *Septentrio Educational* (1), 15–25. https://doi.org/10.7557/8.7048.

[17] Losleben, L. K., Clerici, M., Holm, V., & Panieri, G. (2023). Cold seeps symphony. *Septentrio Educational* (1), 40–46. https://doi.org/10.7557/8.7051.

[18] Oddone, D., & Panieri G. (2022). Akma 2-Ocean Senses Expedition on RV Kronprins Haakon. https://www.youtube.com/watch?v=QV7LbXPK0Z0, last access December 2023.

[19] Losleben, L. K., Clerici, M., Holm, V., & Panieri, G. (2023). Cold seeps symphony. *Septentrio Educational* (1), 40–46. https://doi.org/10.7557/8.7051.

[20] Holm, V., Losleben, L. K., Zimmermann, H. J., Clerici, M., & Panieri, G. (2023). The foraminifera boogie. *Septentrio Educational* (1), 47–51. https://doi.org/10.7557/8.7052.

[21] Maric, F., Poto, M., & Panieri, G. (2023). Where is the (ancient) ocean floor? *Septentrio Educational* (1), 71–73. https://doi.org/10.7557/8.7054.

[22] Maric, F., Poto, M., Zimmermann, H. J., & Panieri, G. (2023). Ocean floor diorama. *Septentrio Educational* (1), 85–87. https://doi.org/10.7557/8.7058.

[23] Maric, F., Poto, M., & Panieri, G. (2023). Under pressure. *Septentrio Educational* (1), 78–80. https://doi.org/10.7557/8.7056.

[24] Maric, F., Poto, M., & Panieri, G. (2023). Arctic Ocean temperatures. *Septentrio Educational* (1), 81–84. https://doi.org/10.7557/8.7057.

[25] Maric, F., Poto, M., Zimmermann, H. J., & Panieri, G. (2023). Sculpting micro-, meio-, and macrofauna. *Septentrio Educational* (1), 88–90. https://doi.org/10.7557/8.7059.

[26] Maric, F., Poto, M., Zimmermann, H. J., & Panieri, G. (2023). Sculpting foraminifera. *Septentrio Educational* (1), 91–93. https://doi.org/10.7557/8.7060.

the largest proportion of the activities were developed.[27] While conceptually fascinating, introducing taste and smell into the realm of ocean literacy presents unique challenges. Taste and smell are easy to feel at sea. When removing water from the top of samples collected at the seafloor, a common method involves siphoning the water using a plastic tube and collecting it in small vials. In some cases, while creating a vacuum allowing the water to descend the tube, the scientists suck in the tube and might drink some water. Regarding the sense of smell, oxidised marine sediments are often characterised by a distinct and pungent odour reminiscent of rotten eggs that are associated with the presence of hydrogen sulphide gas, which is a by-product of microbial activity during the decomposition of organic matter in anaerobic (low oxygen) conditions. When sediments undergo oxidation, sulphur compounds are released, giving rise to the characteristic smell of hydrogen sulphide. Despite the challenges of reproducing those characteristics, the team successfully developed a unique and engaging activity that conveyed these sensory experiences in more common learning environments and brought the sensory elements of taste and smell to life within the context of ocean literacy.[28]

3.3 Applications to Multicultural Contexts

The OSAB has been translated into several languages so far (English, Chinese, Ukrainian, Farsi).[29,30] The translation primarily focuses on the teaching instructions for each activity to ensure that the instructions, when translated, effectively convey the holistic, experiential aspects of the activities, enabling participants to engage and benefit from the multisensory focus regardless of the language they speak. Recognising the importance of translating the OSAB into different languages resulted from several reasons: the international team of scientists and students on

[27] Panieri, G., & Stiller-Reeve, M. (Eds.). (2023). *The Ocean Senses Activity Book.* Septentrio Educational, 2023(1). https://doi.org/10.7557/se.2023.1.

[28] Stiller-Reeve, M., Rosnes, E., Eiliertsen, M., Ramalho, S., Poddevin, V., & Panieri, G. (2023). Life from bad smells. *Septentrio Educational* (1), 27–33. https://doi.org/10.7557/8.7049.

[29] https://septentrio.uit.no/index.php/SapEdu/issue/view/682, https://doi.org/10.7557/se.2023.2.

[30] https://septentrio.uit.no/index.php/SapEdu/issue/view/687, https://doi.org/10.7557/se.2023.3.

board the research vessel; the expedition's goal of reaching scientists and the public worldwide; and the willingness to contribute to the central and transformative promise for the 2030 Agenda for Sustainable Development (Agenda 2023) and its Sustainable Development Goals (SDGs) to "leave no one behind".[31] "Leave no one behind" represents the unequivocal commitment of all UN Member States to "eradicate poverty in all its forms, end discrimination and exclusion, and reduce the inequalities and vulnerabilities that leave people behind and undermine the potential of individuals and of humanity as a whole".[32]

Our multilingual approach has far-reaching benefits that extend beyond the act of translation itself. For the OSAB it was very important for several reasons described below:

Global audience: We wanted to give access to the booklet to a wider audience, making the content accessible to children and adults from diverse linguistic backgrounds. Making the booklet available in multiple languages ensures that a broader and more international audience can benefit from the multisensory approach to OL afforded by The Ocean Senses Activity Book.

Cultural relevance: Language is closely tied to culture. Translating the book allows for cultural nuances and specific references to be tailored to each target audience. This enhances the book's relevance and resonance with readers in different regions, fostering a deeper connection with the material. Overall, multilingual books can also facilitate cultural exchange.[33] Children from different linguistic backgrounds can share their perspectives and learn from one another's experiences, creating a richer and more interconnected global community.

Inclusivity and equity: Multilingual translations promote inclusivity and equity by ensuring that children from various linguistic and cultural backgrounds have equal opportunities to access educational resources about

[31] Leaving No One Behind: Equality and Non-Discrimination at the Heart of Sustainable Development. The United Nations System Shred Framework for Action. 65 pp. https://unsceb.org/sites/default/files/imported_files/CEB%20equality%20framework-A4-web-rev3.pdf, last access November 26, 2023.

[32] Leaving No One Behind: Equality and Non-Discrimination at the Heart of Sustainable Development. The United Nations System Shred Framework for Action. 65 pp. https://unsceb.org/sites/default/files/imported_files/CEB%20equality%20framework-A4-web-rev3.pdf.

[33] Kümmerling-Meibauer, B. (2013). Multilingualism and children's literature. *Bookbird: A Journal of International Children's Literature*, *51*(3), iv–x.

the oceans. This is particularly important for marginalised or underrepresented communities.[34] In addition,[35] climate change and the consequent sea level rise will impact coastal areas ever more profoundly,[36] making OL for people living in coastal areas a matter of paramount importance.

Global collaboration: Another important aspect of the OSAB translations is the global collaboration that might encourage cross-cultural collaboration among educators, parents, and children. Collaborative efforts among people from different language backgrounds can lead to more holistic approaches to education and action for ocean stewardship.[37]

Environmental awareness[38]: Translating the book helps disseminate knowledge about the oceans and ocean conservation on a global scale, fostering a sense of shared responsibility among the global citizenry. By exploring the intricate world of the oceans through sensory experiences, "Ocean Senses", has the potential to encourage readers to appreciate the interconnectedness of marine ecosystems and instil a sense of responsibility towards preserving our oceans.

[34] Pazoto, C. E. P., Silva, E. L., & Duarte, M. R. (2022). Ocean literacy in Brazilian school curricula: An opportunity to improve coastal management and address coastal risks? *Ocean & Coastal Management, 219*, 106047. http://doi.org/10.1016/j.ocecoaman.2022.106047.

[35] Pazoto, C. E. P., Silva, E. L., & Duarte, M. R. (2022). Ocean literacy in Brazilian school curricula: An opportunity to improve coastal management and address coastal risks? *Ocean & Coastal Management, 219*, 106047. http://doi.org/10.1016/j.ocecoaman.2022.106047.

[36] Martinich, J., et al. (2013). Risks of sea level rise to disadvantaged communities in the United States. *Mitigation and Adaptation Strategies for Global Change, 18*(2), 169–185. http://doi.org/10.1007/s11027-011-9356-0.

[37] Child, J. (2001). Trust—The fundamental bond in global collaboration. *Organizational Dynamics, 29*(4), 274–288. https://doi.org/10.1016/S0090-2616(01)00033-X.

[38] Gadenne, D. L., Kennedy, J., & McKeiver, C. (2009). An empirical study of environmental awareness and practices in SMEs. *Journal of Business Ethics, 84*, 45–63.

4 Importance of Multisensorial Learning in Ocean Literacy

The oceans and their multiple ecosystems, which cover more than half of the submerged surface of our planet, are explored by scientists on diverse levels. However, bringing the deep sea closer to the public can be challenging due to limited educational tools, the absence of ocean literacy in formal education systems, and a general lack of public awareness.[39,40,41] The dissemination of knowledge about deep-sea ecosystems is vital for societal recognition and protection.[42]

Starting from early childhood, children are taught stories and facts about the miraculous blue deep waters and various sea creatures by the grown-ups around them. It is interesting for the children and adults to talk about deep waters, including the huge ocean animals like whales, seals, and octopuses, and small marine life species like shrimps, clownfish, and plankton. Yet, for the general public, obtaining detailed but comprehensible information about vital ecosystem services that the ocean provides takes work. Due to the lack of integration of ocean literacy in the formal education systems, a great deal of society needs to gain awareness and valuable knowledge that the scientists prove through their research.[43] This gap is filled mostly by the informal marine education programmes and/or educational tools that better equip the teachers, parents, or caregivers in ocean literacy so that the children and youngsters can benefit from it. The OSAB represent a tool that fits the gap.

The book offers various activities to explore the ocean systems and these activities are designed with a multisensory teaching approach, which

[39] Salazar, J., Dominguez-Carrió, C., Gili, J. M., Ambroso, S., Grinyó, J., & Vendrell-Simón, B. (2019). Building a new ocean literacy approach based on a simulated dive in a submarine: A multisensory workshop to bring the deep sea closer to people. *Frontiers in Marine Science*, *6*, 576.

[40] O'Brien, M., Freitas, C., Venzo, P., & Francis, P. (2023). Fostering ocean literacy through informal marine education programs. *Marine Pollution Bulletin*, *193*, 115208.

[41] Thistle, D. (2003). The deep-sea floor: An overview. *Ecosystems of the Deep Oceans*, 5.

[42] Ibid. (see footnote 40).

[43] Salazar, J., Dominguez-Carrió, C., Gili, J. M., Ambroso, S., Grinyó, J., & Vendrell-Simón, B. (2019). Building a new ocean literacy approach based on a simulated dive in a submarine: A multisensory workshop to bring the deep sea closer to people. *Frontiers in Marine Science*, *6*, 576.

is advantageous in many aspects. Multisensory learning appeals to a wide range of age groups from preschool children to adults, accordingly the activities in the book connect various groups allowing them to have the same experience no matter their age or background. Shams and Seitz[44] suggest that the human brain has evolved to function and develop ideally in multisensorial environments where behaviour is guided by the information that is integrated across multiple sensory modalities. Multisensory training tools reach the natural settings of the human brain better than unisensory protocols and therefore, the learning experience becomes more efficient and persistent. During the learning experience, the multi-sensory approach involves different parts of the brain in the learning process simultaneously, which provides the learner to make multiple connections, comprehend multiple concepts, and maintain better memory performance.[45] The OSAB utilises this process with its various multisensorial activities by creating an engaging immersive training environment. This provides the learners hands-on learning experience by creating an artificial environment that reflects real-life scenarios where they can learn and master new skills. In this way, The OSAB offers a worthwhile approach to ocean literacy as the activities facilitate the use of senses and emotions for various types of learners. Delivering OL and understanding its fundamentals is crucial for all levels of society to raise awareness on ocean-related topics.

5 Conclusion

In the face of the climate crisis and the complex social, economic, and environmental challenges we are experiencing as a global society, it is important to create accessible educational resources that engage the general public (children and adults) to foster a deeper sense of understanding and care towards the environment and in the context of this chapter, the oceans. For many, the ocean is a place of vast beauty and curiosity; yet there is a lack of accessible resources on OL and a disconnect between the scientific community and the general public when it

[44] Shams, L., & Seitz, A. R. (2008). Benefits of multisensory learning. *Trends in Cognitive Sciences*, *12*(11), 411–417.

[45] Okray, Z., Jacob, P. F., Stern, C., Desmond, K., Otto, N., Talbot, C. B., … Waddell, S. (2023). Multisensory learning binds neurons into a cross-modal memory engram. *Nature*, 1–8.

comes to understanding the delicate aquatic ecosystems. As a result of the AKMA2-Ocean Senses Research Expedition, marine scientists, educators, and social scientists came together to address this knowledge gap by co-creating an interdisciplinary, multisensory activity book centred around the oceans.

As highlighted throughout the chapter, The Ocean Senses Activity Book addresses the pressing need for scientists to communicate scientific issues more effectively with the public.[46] The OSAB aims to go beyond Open Access by incorporating FAIR principles to ensure the OL resources are not only accessible but also findable, interoperable, and reusable. Educational resources like the OSAB even go beyond the current goals and targets of the SDGs, offering an effective strategy for including the general public in efforts towards ocean conservation. Surprisingly, SDG 4 *Quality Education* and SDG 14 *Life Below Water* fail to mention the importance of making scientific research more accessible to the public and the importance of OL and other forms of ecological education. Translating the intricacies and density of scientific research into multisensory learning programmes for all, such as the OSAB, offers an effective approach to engaging citizens with ocean science and fostering a more engaged population with the knowledge and awareness to take action towards protecting the oceans.

Furthermore, the OSAB offers a learning platform that caters to diverse needs and cultural contexts. Developing a multisensory learning approach meets the demand for inclusive, quality education and overcomes various learning barriers. The book's multisensory sessions and interactive activities, translated into multiple languages (to date Chinese,[47] Ukrainian,[48] English, and Farsi), engage teachers, learners, researchers, and communities in ocean-related discussions and hands-on activities, fostering ocean literacy and stewardship.

[46] O'Brien, M., Freitas, C., Venzo, P., & Francis, P. (2023). Fostering ocean literacy through informal marine education programs. *Marine Pollution Bulletin, 193*, 115208; Freitas, C., Francis, P., Bellgrove, A., & Venzo, P. (2023). Adopting ocean-themed picture books to promote ocean literacy in primary education. *Children's Literature in Education*, 1–16; McCauley, V., Davison, K., McHugh, P., Domegan, C., & Grehan, A. (2021). Innovative education strategies to advance ocean literacy. *Ocean Literacy: Understanding the Ocean*, 149–168.

[47] Panieri et al., No. 2 (2023). *The Ocean Senses Activity Book* (Chinese version by Giuliano Bertolotto Bianc). https://doi.org/10.7557/se.2023.2.

[48] Паньєрі Дж, Стіллер-Рів М, редактори. Сприйняття океану: Плани уроків. Пефтієва О,перекладач. Septentrio Educational, 2023(3). https://doi.org/10.7557/se.2023.3.