# Universally Accessible Marine Science and Ocean Literacy for All Citizens: The Thalassophile Project

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**Abstract** The Thalassophile Project is dedicated to universal accessibility in marine science and ocean literacy, with a focus on the d/Deaf and

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visually impaired communities. By emphasising accessibility, and illustrating how theory is put into practice, the project brings together a network of cross-sector practitioners, combining marine research, education, and universal accessibility expertise. In this way, the authors propose to foster global awareness of marine sustainability put forward in the Sustainable Development Goals targets. Equally, the Thalassophile Project aims to raise awareness within adult education institutions of the significant number of citizens unable to gain access to information, and a corresponding lack of experience and competence in adult educators in producing barrier-free "Blue Education" resources. The project's practical initiatives address this gap in educational resources by intertwining SDGs 4, 13, and 14 and aligning with international frameworks such as ESD 2030 and UNESCO guidelines. Activities include creating introductory "episodes" as educational tools, an online resource database, and user-friendly factsheets for specific audiences. The theoretical Common Accessibility Framework forms a baseline for all activities, rooted in Universal Design for Learning. These first pilot activities aim to show how more equitable access for adult learners to high-quality information on ocean sciences and literacy can be effectively achieved and at the same time, inspire and empower people and communities to join forces in making this goal a reality. Finally, this chapter describes outreach efforts, including presentations at international conferences.

**Keywords** Accessibility · Inclusion · Education · Research · Ocean

# 1    INTRODUCTION

Thalassophile (n.) A lover of the seas and Ocean. Thalassophile is a word derived from the Ancient Greek θάλασσα (thálassa, "sea"), and φίλος (phílos, "dear, beloved").

### 1.1   *Practical Initiatives to Implement International Frameworks*

The core objective of Thalassophile Project[1] is to promote the concept of universal accessibility to marine science, marine conservation, and the so-called Blue Education[2] (referring to ocean literacy). Within the scope of the project, universal accessibility refers but is not limited to, hard of hearing, d/Deaf, blind, and partially sighted people. In this chapter, we will use the terms d/Deaf and visually impaired individuals.

If society is to overcome the growing challenges posed by climate change, our collective action must first be stimulated by education and evidence-based information that is available to all.

International standards provide a framework for governments to increase universal accessibility in a systematic way. The Education for Sustainable Development (ESD) 2030 Roadmap (UNESCO, 2020) is linked to Sustainable Development Goal (SDG) 4 (Quality Education) and gives us a Framework for Action which provides guidance for the implementation of ambitious climate change goals and commitments. The UNESCO Institute for Lifelong Learning[3] is similarly monitoring of normative and legal frameworks to reduce inequality as a way of promoting inclusive, lifelong access to learning. UNESDOC states that the "ESD employs action-oriented, innovative pedagogy to enable learners to develop knowledge and awareness and take action to transform society into a more sustainable one". Transforming sustainable development learning environments, building capacities of educators, and accelerating inclusive local-level action are all priority areas for the ESD 2030 Roadmap. But how are educators, marine researchers, and conservationists supposed to implement universal accessibility in practice, in outreach and ocean literacy initiatives?

The Thalassophile Project is a response to this question. The Thalassophile Project brings together marine researchers and experts in a first step towards a network of cross-sector practitioners promoting universal accessibility in ocean literacy. The particular focus in this project is on

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[1] The Thalassophile Project: Accessible marine science and conservation for all citizens © 2022-2024 by The Thalassophile Project Partnership, Erasmus+ Project Number 2022-1-DE02-KA210-ADU-000082213; https://www.thalassophileproject.org/.

[2] https://www.bluemarinefoundation.com/2020/03/25/blue-education-resources/.

[3] UNESCO Institute Lifelong Learning. https://www.uil.unesco.org/en/.

producing tailored resources for students with sensorial disabilities that are also useful across disciplines.

The project partnership was conceived as a contribution to the global effort to promote educational equality and aims to make marine science and conservation material in adult education environments more accessible to visually impaired and d/Deaf adults, thereby including this target group to learn about the importance of the Ocean and what we can all do to sustain it. This provides a multifaceted approach for all participants involved and is elemental for ocean science to be accessible for all. The outputs of the project include high-quality content on marine sustainability, with pioneering methods to practise accessible pedagogical approaches.

A transversal objective of the Thalassophile Project is to raise the awareness of adult educators and organisations that develop marine science and conservation educational material. Only by bridging the gap between adult education, educational authorities, and marine research can we ensure that people of all ages with hearing and/or sight loss are reliably informed about marine science and conservation, with engaging and accessible material.

### 1.2    Connecting Communities with Marine Sustainability

The Ocean covers 70% of the Earth's surface (Schmitt, 1995). Our Ocean feeds us, regulates our climate, and generates most of the oxygen we breathe (Pandey et al., 2021). Therefore, it is pivotal that accurate and engaging information is accessible to the widest number of people to achieve a critical mass of citizens who are ready and able to change their behaviours for the better. Everyone has the right to be able to explore, study, and have access to the tools and resources to preserve the Ocean and be a part of the solution.

- Changing hearts and minds and inspiring climate action begins with education, and a pre-requisite for education is access to engaging information which shows how each one of us can make a difference.
- Marine scientists do not reflect the same diversity of perspectives and experiences of the world as the communities who bear the largest burden for implementing—or adverse consequences for failing to implement—conservation action (Smith et al., 2017).

- Climate literacy, in its complexity and with geopolitical connotations, is already a challenge for educational institutions at all levels. This project will fully open doors and will inspire change by providing competence and material for adult educators to react to barriers.

Against the backdrop of these challenges, the barriers to universal accessibility of marine sustainability can seem insurmountable. With marine science and conservation not being a requirement in European school curricula, the responsibility of informing adult learners about the importance of the Ocean falls to museums, conservation centres, higher education institutes and universities. While these institutions have made significant efforts in increasing the quality and quantity of formal and informal "Blue Educational" material, however, there is almost no adult education material on marine conservation and marine science that is available, in Braille and/or signed formats, and a corresponding lack of awareness in organisations and institutions on how to develop these types of services. The lack of competence and understanding of adult educators of this target group translates into a lack of inclusive educational environments (Braun et al., 2018). By curating suitable educational material and by piloting new content, the Thalassophile Project aims to ensure barrier-free access for all citizens to information about how the health of the Ocean is related to climate change, and what we can all do to support sustainability: climate and ocean literacy begins with education, and this gap needs to be filled.

## 2    Who Benefits from the Thalassophile Project Approach?

In a 2015 census,[4] the European Federation of Hard of Hearing People (EFHOH) believed there to be 51 million hard-of-hearing people in the European Union, with Spain having the highest number of registered deaf people (3.5 million). That is approximately one in ten of the EU population. Yet, it is not common to find marine science and conservation material interpreted into sign language or other mediums for the hard of hearing.

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[4] European Federation of Hard of Hearing People 2015 Annual Report.

There are approximately 30 million blind or partially sighted people living in Europe today. One of the key recommendations of the 2022 European Blind Union (EBU) Statement on Access to Reading and Using Braille[5] is for general educational offers and learning material to be made available to blind people in Braille.

The Thalassophile Project addresses these target groups by creating a framework for overcoming some of these barriers and moving in the direction of providing accessible information for all.

## 3    PROJECT ACTIVITIES

Four key activities have been agreed on to promote the concept of universal accessibility in marine science, marine conservation, and "Blue Education" (Fig. 1). At first a theoretical common accessibility framework was developed to outline what should be considered when preparing educational materials. This framework was then applied to educational pilot episodes that are tailored to the needs of the user. Finally, adult educator factsheets were created to detail what was learned in this process and create a quick and easy information sheet for replicability. Throughout the project, transversal activities involved networking with institutions and organisations in the field to learn from and provide a platform to showcase other accessible resources.
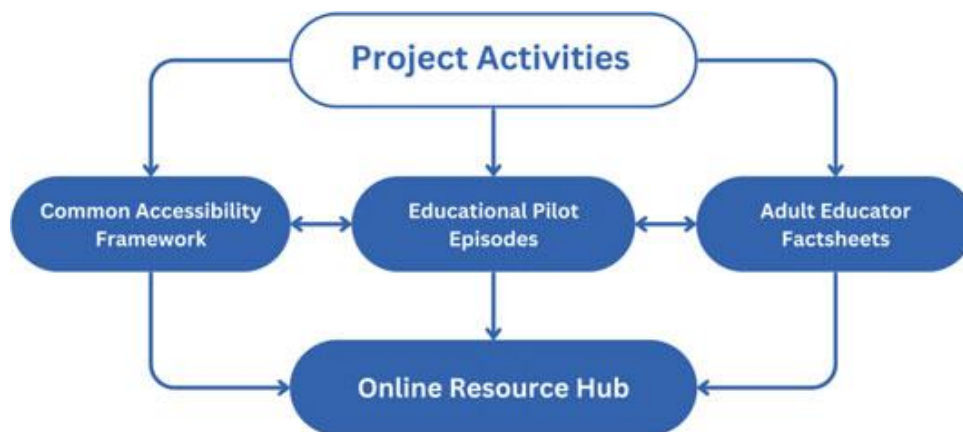


**Fig. 1**    Infographic showcasing the Thalassophile Project Activities

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[5] EBU Statement on Access to Reading and Using Braille—2022.

### *3.1   Common Accessibility Framework*

This framework serves as a guide in the selection of what material is collated and curated in the project's online database. It forms the guidelines for creating original, engaging material tailored to provide effective "Blue Education" opportunities to d/Deaf and/or visually impaired people (Fig. 2).

The Universal Design for Learning: A design for all[6]

Universal Design for Learning (UDL) is a teaching approach aimed at providing equal opportunities for the success for all learners. The fundamental principle of UDL is that there isn't a "standard" person, and that each individual learns differently based on their personal story and growth, and on multiple other factors: physical, emotional, behavioural, neurological, and cultural. The aim of Universal Design for Learning is therefore to improve the educational experience of all by introducing more flexible methods of teaching and assessment and creating truly inclusive materials that can be adapted to all types of people.

In other words, UDL promotes the use of a variety of methods and design in order to remove any barriers to learning and ensure that people learn in ways they are most comfortable with. Each person has specific ways of engaging and specific methods of acquiring information, for example, while some enjoy reading a text, others learn by listening. UDL is rooted in Universal Design: it is a methodology which aims to conceive flexible products and accessible environments in order to be possible for all to participate in an equal way.

Universal Design's principles are:

1. Equitable Use—The design should be useful and marketable to people with diverse abilities.
2. Flexibility in Use—The design should accommodate a wide range of individual preferences and abilities.
3. Simple and Intuitive Use—User-friendly approach, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible Information—Effective communication of information necessary to the user, regardless of ambient conditions or the user's
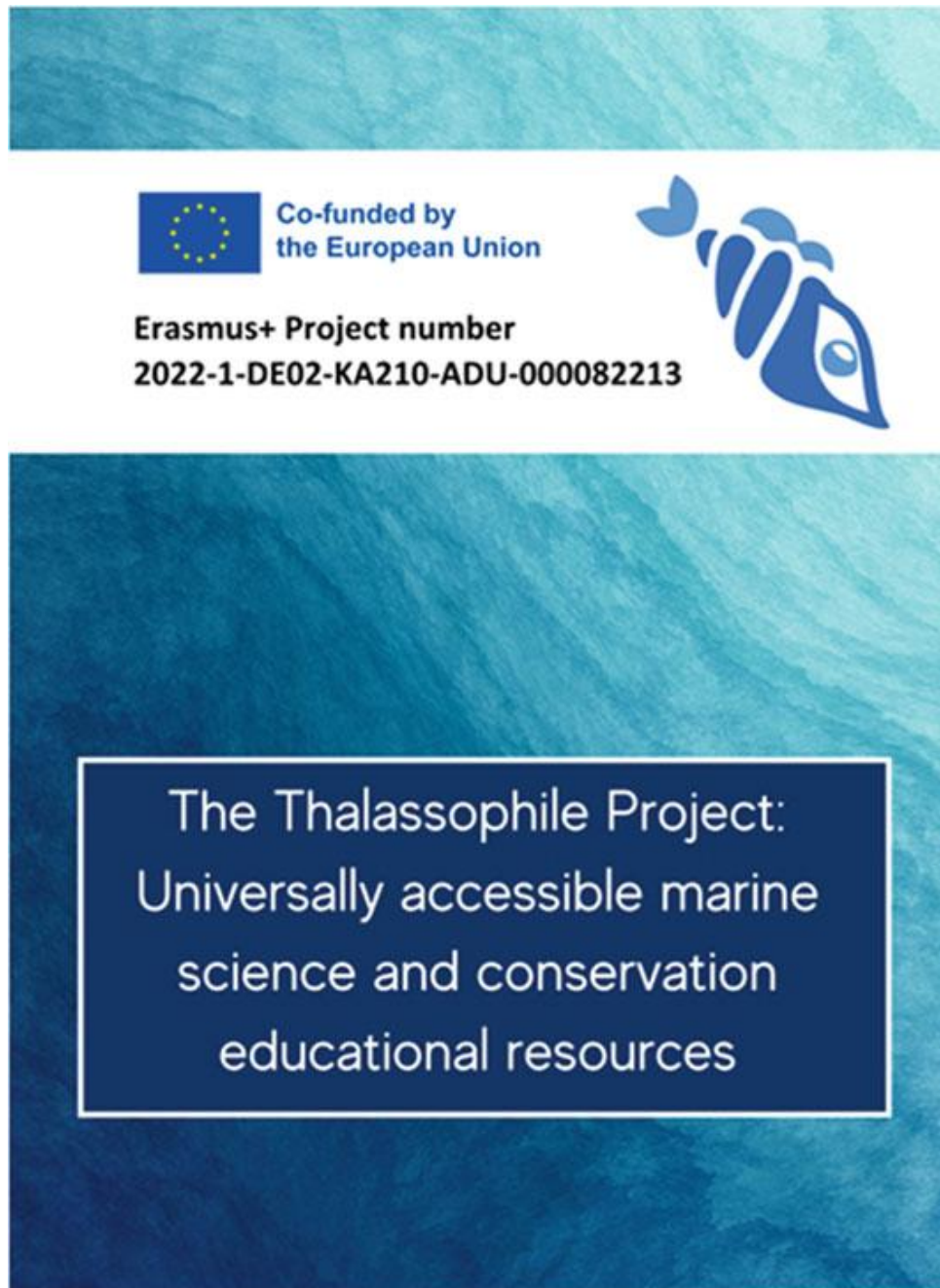
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[6] https://udlguidelines.cast.org/.

**Fig. 2**    The Thalassophile Project: Common Accessibility Framework[7]

sensory abilities. For example, a video that includes audio and subtitles.

5. Tolerance for Error—The design should minimise accidental or unintended risks in the environment.

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[7] https://www.thalassophileproject.org/the-framework.

6. Low Physical Effort—The design should be efficient, comfortable, and with a minimum of fatigue.
7. Appropriate Size and Space for Approach and Use—Size and space should be accessible for all regardless of physical characteristics such as size or mobility. The goal of Universal Design is to maximise usability by individuals with a wide variety of characteristics.

### 3.2  Original Pilots of Accessible "Blue Education" Material

Educational pilot videos for adult education institutions have been created to showcase how accessibility can be incorporated in their programmes. The educational material is being designed both to directly inform its target audience of d/Deaf and visually impaired people, and to promote barrier-free access to marine science and conservation to adult educators (Fig. 3).

The co-creation brings together scientific and conservation experts with experts in multisensory education and will help visually impaired and d/Deaf adults to understand:



**Fig. 3**  Excerpt from the translation of the educational pilot episodes in International Signs

1. the importance of our seas and Ocean in the context of climate change;
2. marine biodiversity;
3. the human impact on our seas and Ocean; and
4. what each of us can do to increase marine sustainability.

These four topics were chosen to be highlighted in our original educational pilot episodes because they support the 2030 Agenda for Sustainable Development (United Nations, 2015). These results are also reflected in the outcomes of The Deep Network project (Chapter XX).

Each episode presents current research in its specific field and through this collaboration, the Thalassophile Project encourages scientists to consider accessibility in their own work.

### 3.3    *Online Resource Hub of Existing Accessible "Blue Education" Material*

An online resource hub has been curated to create a network of organisations in marine science and conservation and to showcase good practice in accessibility. This hub includes organisations that support educational initiatives for d/Deaf and visually impaired, providing an online database of existing educational material that helps promote the availability and use of accessible marine content to adult educators and adult education institutions. The online content is organised by the specific needs of visually impaired and d/Deaf learners and categorised into the four themes of marine conservation priorities, as stated previously, with links to marine conservation and advocacy information, academic marine science information, and local initiatives.

As the network expands, and marine scientists begin to appreciate and incorporate visually impaired and d/Deaf learning requirements into their own workflow, the hope is that the momentum of inclusivity for all can continue allowing for more alternative and complex research-based teaching material to be made available on the database.

Some examples of Ocean-oriented organisations, initiatives, and good practices that are showcased in our resource hub include:

1. The Ocean Senses Activity Book (Panieri & Stiller-Reeve, 2023);
2. EGU General Assembly Accessibility and Inclusiveness[8];
3. Accessible Oceans: Exploring Data Through Sound[9];
4. Abecedarium: the Ocean in Sign Language[10]; and
5. EcoSpectrum.[11]

Each of these initiatives demonstrate different approaches to address, some, if not all of the learning requirements for d/Deaf and visually impaired, that are outlined in our framework. It is important to showcase what different organisations are developing and implementing in this field in order to provide concrete evidence that the general trend is moving towards more inclusivity.

### 3.4 User-Friendly and Digestible Factsheets to Improve Adult Education Competencies in Accessible "Blue Education" Material

The factsheets were created as the project progressed to include the lessons learned along the way of what works well and what not so much. These experiences and information are consolidated into user-friendly and easily digestible factsheets, designed primarily for the use of adult educators. The factsheets combine the accessibility framework, original content from the pilot episodes and the existing accessible content, collated in the online hub, to improve the skills and competences of adult educators and organisations who inform adults about marine science and conservation.

In addition to gaining an understanding of what is necessary in terms of "Blue Education" literacy for d/Deaf and visually impaired individuals, this activity communicates what is proven to work, and gives examples of how to produce the content with plenty of online resources and content that is readily available in one place.

The factsheets are aimed squarely at adult educators and will address:

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[8] https://egu23.eu/about/accessibility_and_inclusiveness.html.

[9] https://accessibleoceans.whoi.edu/.

[10] https://www.ocean-space.org/education/abecedarium-lis.

[11] https://www.instagram.com/eco.spectrum/.

- How and why high-quality information on "Blue Education" should be provided in their institutions (including information on the UNESCO call to governments to act to educate all citizens in climate literacy as a first step to action);
- Guidance provisions to facilitate access to participation;
- Tips on how to improve visibility of the gains resulting from educating all adults in climate literacy;
- How to ensure a better match between the demands of d/Deaf and visually impaired individuals and supply of engaging educational material;
- How to network with other adult educators/education institutions addressing "Blue Education", and how to connect with expert organisations representing visually impaired and d/Deaf communities.

## 4    THALASSOPHILE OUTREACH AND NETWORKING

To reach the intended audience Thalassophile Project has disseminated the project in different settings to make sure the framework is available and accessible for use. In this section, the different Thalassophile Project presentations and outreach activities are described, reaching both target groups: scientists and adult educators who could use the output of this project to make their work more accessible.

The Thalassophile Project has been presented at various events and conferences such as the 1st International Conference on Ocean Education & Training in Ghent, Belgium (Jan. 2023), and at workshops such as the Ocean Interconnectedness: Senses & Science, Law & Love (Sept. 2023) (Fig. 4). Overall, this initiative was received with high praise for its innovation and ambition.

The Framework has already been used by various projects (Into the Deep,[12] Deep Network[13]) as well as to support the accessibility of the

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[12] Into the Deep, Marine Image Analysis Hub for Citizen Scientists; Project number: 2022-1-DE02-KA220-ADU-000088137.

[13] Deep Network, Curating and co-producing quality ocean-education information for adults; Project number: 2022-2-DE02-KA210-ADU-000097962.

**Fig. 4** Thalassophile Project at the Ocean Interconnectedness Workshop in Tromsø, Norway (From left to right: Giuliana Panieri, Rada Pandeva)

"Alive, Alive, O! Calling the Blue Mussel Home to the Exe" film.[14] Additionally, the project has been recognised by the EU4Ocean Coalition.[15] In 2024 the Thalassophile Project will be presented to scientists at the Alfred Wegener Institute for Polar and Marine Science in Bremerhaven, Germany, and has applied to present at the 2024 Ocean Decade Conference in Barcelona.

[14] "Alive Alive O! Calling the Blue Mussel Home to the Exe." www.youtube.com/watch?v=pz7lai2m86A.

[15] https://maritime-forum.ec.europa.eu/node/5512_en.

# 5    Concluding Remarks

The Thalassophile Project contributes to Sustainable Development Goals 4 (Quality education), 13 (Climate action), and 14 (Life below water), serving as a beacon for making marine science and ocean literacy universally accessible. The aim of the project is to ensure that knowledge about the Ocean and conservation reaches every corner of society.

Over the course of project activities, it has become apparent to the authors that there is a clear need to fill the gap in accessible educational resources, to ensure that "Blue Education" is available to all. Only in this way can we hope for all adults to understand the Ocean as a resource, to adjust practices in their daily lives, and to support others around them to do the same.

In response to a growing trend within the scientific community towards enhanced accessibility in figure presentation, the Thalassophile Project not only builds upon existing practices but also establishes connections across disciplines. However, steps need to be taken by leading figures within the community to promote the use of simple tools (such as those in the Thalassophile Project Common Accessibility Framework) to ensure that the maximum possible number of learners benefit from accessing their research.

Within the educational community, anyone designing information, resources, or messaging on the Ocean for the adult community should be aware of the nature of different barriers to learning. Educators should be trained in different methods of delivery and support for accessibility practice, information communication, sensory access, and delivery of direct instruction for educational activities. Specific spaces should be made available for these learning needs, which might need to be distinct from other learning environments.

On the level of policy, resources need to be committed to both educational and research organisations to ensure that scientists and educators are trained in the needs of all adult learners. Within this training, both groups should be introduced to simple tools and methods to ensure their work is easy to read and understand. Delivering interdisciplinary training with both groups could be one way to promote the kind of information-sharing that could sustain long-term initiatives in this sector.

Finally, the Thalassophile Project and authors of this chapter welcome and encourage the widespread use of the framework and factsheets so that

the momentum for this movement for universal accessibility within ocean science continues.

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