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Teresa J. Kennedy *Editor*

Ocean Literacy: The Foundation for the Success of the Ocean Decade, Volume III

Accelerating Communication, Technology, and Global Initiatives

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The BlueSchoolsMed Project Experience: An Overview of the Conception, Implementation, Evaluation, and Dissemination of the "Blue Challenges" within Mediterranean Schools

Vera Noon, Panayota Koulouri, Argiro Andriopoulou, Athanasios Mogias, Francesca Alvisi, Anita Pócsai, Diego Albanese, Mark Mifsud, Johann Galdies, Carolyn Scheurle, and Olga Mashkina

Abstract

Within the framework of the UN Decade of Ocean Science for Sustainable Development, alongside the EU efforts to promote Ocean Literacy (OL) across Europe (EU), and in line with the EU4Ocean Ocean Literacy Coalition, the Erasmus+ BlueSchoolsMed mobility proj-

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ect entitled "*Supporting the development of socially inclusive Blue Challenges in schools in the Mediterranean Sea basin*" (2020–2023) was designed and implemented to integrate the OL principles into school curricula. Ten partner institutions from Italy, France, Greece, and Malta worked together with teachers and students from 19 pilot schools to test innovative educational methods and activities focusing on sea-related topics. The three-year project was implemented in four phases: Conception, Implementation, Evaluation and Dissemination.

Despite the challenges imposed by COVID-19, the project succeeded in implementing its mobility activities (transnational partner meetings, training workshops for teachers and students, and public dissemination events) engaging partners, teachers, students, maritime stakeholders and high-level representatives of educational communities and international organizations. This chapter provides an overview of the challenges, lessons learnt, and recommendations derived from the project implementation, which can inform future Ocean Literacy initiatives in the Mediterranean.

Keywords

Ocean Literacy (OL) · Mediterranean Sea · Blue Schools · Sustainability education · Blue Challenges · NEBS

17.1 Introduction

Within the context of the UN Decade of Ocean Science for Sustainable Development (2021–2030), Ocean Literacy (OL) has been integrated as a fundamental component to achieve its vision, emphasizing the progression from awareness to behavior change in driving action towards Ocean sustainability (UNESCO 2021). In parallel with this growing recognition, OL gradually made its way to European policies, with multiple funds supporting the promotion of OL (Horizon 2020, Green Deal, EU Missions, etc.) and directed to projects such as SeaChange, ResponSEAble, BlueLightS, ProBleu, SHORE (information about each project can be found in the resources section). In fact, one of the significant milestones on a European level was the establishment of the EU4Ocean coalition in 2020, made up of three main components: The EU4Ocean platform, the Youth4Ocean forum and the Network of European Blue Schools (NEBS) (European Commission n.d.).

Fig. 17.1 The BlueSchoolsMed project logo

It is within this framework that the Erasmus+ BlueSchoolsMed project "Supporting the development of socially inclusive Blue Challenges in schools in the Mediterranean Sea basin" was developed (Fig. 17.1), with the objective to integrate the OL principles into Mediterranean school curricula. Ten partner institutions from four Mediterranean countries (Italy, France, Greece, and Malta) worked together with teachers and students from 19 pilot schools to design, implement, evaluate, and disseminate Ocean-related projects (Fig. 17.2).

The main project objectives were to: (a) increase students' understanding of the marine environment, the threats it is facing, and the need for sustainable management of its resources; (b) develop a sense of responsibility within the schools' ecosystems, promoting eco-citizenship and ownership in regard to the coastal and marine environment; (c) design multidisciplinary educational tools and OL resources that can be used by teachers of the Mediterranean Regional Sea Area (RSA) and beyond; (d) elevate the conversation

Fig. 17.2 Location map of the BlueSchoolsMed project's pilot Mediterranean schools

by engaging maritime stakeholders and policymakers.

The BlueSchoolsMed project lasted three years (2020–2023) and was implemented in four phases: (1) Conception: Planning the BlueSchoolsMed project activities; (2) Implementation: Designing and delivering the Blue Challenges/projects; (3) Evaluation: Assessing the impact of the Blue Challenges; and (4) Dissemination: Sharing the results of the project.

This chapter follows the same structure, outlining the key challenges and success stories experienced throughout the three years, and concludes with a list of targeted recommendations.

17.2 Conception Phase: Planning the BlueSchoolsMed Project

17.2.1 The BlueSchoolsMed Project Design

Based on the EU4Ocean objectives and the guidelines of Network of European Blue Schools (NEBS), as well as the Erasmus+ mobility requirements, the conception phase started by setting a detailed planning of the BlueSchoolsMed three-year activities, milestones, events and outputs.

To launch the project on the right track, the project team met regularly with invited teachers and principals of the schools involved. This step consolidated the consortium of partner institutions and helped to define their specific roles within the project and share their practical experiences in Mediterranean contexts.

This phase allowed the project team to explore collaboration opportunities and understand the challenges that teachers and schools could face in the process of joining the NEBS. This preliminary diagnostic revealed that teachers needed incentives, resources and recognition to remain engaged for the project's duration. It also helped in mobilizing schools and students that wished to be involved, and setting the stage for the upcoming activities' implementation.

The main output of this phase was the development of a guiding document, "The Mediterranean Blue challenges framework" which prepared the groundwork for the concep-

tion, implementation and evaluation of the Blue Challenges within the pilot schools (Alvisi et al. 2022).

17.2.2 The Project Framework

The BlueSchoolsMed project's core principles co-construction and co-design of the Blue Challenges, interaction and proactivity, inclusiveness, and sustainability guided the development of the framework document. The framework was further informed by the collection and validation of existing practices in "bringing the sea" to schools. As a starting point, the project team conducted an initial analysis of the resources and tools available at the EU and International level, focusing on content that teachers and educators can rely on to help schools join the NEBS. A handbook for teachers, previously published by the NEBS (Copejans et al. 2020) served as an initial key reference for the project activities.

The framework first defined the Blue Challenges and their scope, then proposed tools and methods for monitoring and evaluation, and finally outlined a roadmap for the development and implementation of the Blue Challenges.

The purpose of the Blue Challenges was to:

- Identify an Ocean-related topic, such as a good or a service that the Ocean provides for human daily life (e.g., fisheries/aquaculture, tourism/recreation, chemical/pharmaceutical products, biology/biotechnology, raw materials, climate/water cycle regulator, etc.), or a human activity that affects the Ocean (e.g., sand/mineral/oil extraction, overfishing and intensive aquaculture, pollution, eutrophication, transport, etc.);
- Co-develop a school project together with a local partnership (i.e., marine scientist/s, stakeholder/s, decision maker/s, etc.); and
- Communicate and share the school project with the society and the local community.

By bringing Blue Challenges into schools, teachers were encouraged to help students develop a stronger connection with the Ocean and marine ecosystems, whether their school is located by the sea or hundreds of kilometers inland. The objective was to increase the students' understanding of Ocean processes and the related issues, impacts, challenges, and threats that it is facing, while fostering a sense of responsibility to take action that support the protection and sustainable management of the Ocean.

The next step was proposing criteria for monitoring and evaluating the Blue Challenges to assess their added value and potential benefits. This required an understanding, from a teacher's perspective, of the most effective strategies for integrating OL into schools and, on that basis, define the steps to achieve this goal and support them in implementing these actions.

A survey was conducted among teachers from the pilot schools to identify their needs for setting up their own blue pathways at their schools, and a list of pros and cons for teachers' participation in the NEBS was compiled. The results indicated that many teachers, especially those participating for the first time, preferred to have a pre-established reference framework with clearly defined, transparent rules of participation and evaluation from the outset.

As such, a methodological path was proposed, structured around specific objectives:

- Align the educational pathways with the Agenda 2030 of the UN Sustainable Development Goals (SDGs), specifically target 4.7 on Education for sustainable development and global citizenship, empowering students and helping them to develop a sense of community;
- Provide training for Blue School teachers (and science animators/educators) on OL principles and concepts in general, with a specific focus on Mediterranean issues;
- Visualize the "big picture", or the spatio-temporal context in which the chosen Blue Challenge is situated;
- Encourage multi- and interdisciplinarity approaches;
- Strengthen critical thinking, scientific inquiry, and citizenship-related transversal skills (e.g.

problem solving, team building, participatory approach and discovery learning);
- Create shared OL resources and materials that teachers can use in schools at the Mediterranean RSA level as well as at European and international levels;
- Foster multi-level networks within the school, across local communities and among Mediterranean schools, with the aim to build local "blue" learning communities; and
- Promote the participation of the wider school community including teachers, students, principals, parents and family members.

17.3 Implementation Phase: Designing and Delivering the School Projects

17.3.1 Co-Designing Projects within Mediterranean Schools

Based on the Mediterranean Blue Challenge Framework document (Alvisi et al. 2022), partners, teachers and students from the four pilot countries were engaged in the co-design and implementation process of 19 Blue Challenges. The school projects are listed in Table 17.1. A detailed description of each of the projects is available online (see the resources section for more information).

To facilitate the co-design process, several communication channels were utilized during the project and varied across the four pilot countries. They ranged from in-person exchanges (events and meetings, personal communication, brochures, roll ups and multilingual flyers distribution, etc.) to online tools (school websites, e-mail lists, newsletters, interactive boards (e.g., Padlet), online storage platform, social media (e.g., X—formerly Twitter, Facebook, WhatsApp chats, etc.).

17.3.2 Engaging Teachers, Students and Marine Stakeholders

In addition to national school activities, three in-person training workshops were organized throughout the project, aiming to facilitate a direct exchange first between partners and teachers and subsequently with students' representatives. The workshops sought to expose students to different Mediterranean ecosystems and maritime activities across the host countries, as well as to the associated threats and challenges. This was achieved through a range of Ocean Literacy activities including field-based games, laboratory experiments, guided visits to local aquaria and museums, and excursions to beaches, natural caves and Marine Protected Areas (MPAs).

It is worth mentioning that the COVID-19 pandemic and its restrictions strongly disrupted the mobility activities, which required devising immediate alternatives. Additionally, the conflict between Russia and Ukraine in 2022 raised safety concerns regarding students' mobility, which also affected the attendance of almost half of the expected participants (French and Maltese students mainly). As a result, some of the in-person meetings and training workshops were organized online, or in a hybrid format. The three training workshops and their activities are summarized in Table 17.2.

The first training event (C1) was supposed to bring together partners and teachers from the four countries in one single transnational event but was replaced instead by national training workshops organized in Greece, Italy, Malta and France. While most teachers expressed their enthusiasm and interest through exchange with their peers, they also shared their doubts and concerns.

The COVID-19 pandemic adaptation measures often meant additional work to teachers and project partners alike, with little to no time allocated to extracurricular/outdoor activities, which are the core of the BlueSchoolsMed project. The challenge was to design an interactive and engaging project while ensuring the safety of the students. Additionally, teachers participated in this project to learn from other Mediterranean countries' context, explore new educational paths and innovative materials, and the COVID-19 restrictions certainly were a hindrance to this objective.

Table 17.1 List of blue projects designed and implemented by the BlueSchoolsMed participating schools

Country	City	School name (participants' age range)	Title of project
France	Villefranche-sur-Mer	École élémentaire Joseph Caldéroni (ages 6–11)	Adopt a float
	Marseille	École de la Roseraie (ages 8–9)	EMA of Anse de la Fausse-Monnaie
	Marseille	École Monnaie des Accoules (ages 9–10)	EMA of St. Estève
	La Ciotat	École Louis Marin (ages 10–11)	EMA of Grand Mugel
Greece	Alexandroupolis	6th Elementary School of Alexandroupolis (ages 9–10)	Tracing the invasive blue crab species (North Aegean Sea)
	Gournes Pediados	Elementary School of Gournes Pediados, Heraklion, Crete (ages 11–12)	Spot the alien Blue Crab: *Portunus segnis* (Cretan Sea)
	Alexandroupolis	11th Elementary School of Alexandroupolis (ages 11–12)	Getting acquainted with a typical Mediterranean estuarine system
	Korydallos, Athens	8th Junior High School of Korydallos (ages 12–15)	Robyssey
Italy	Quarto, Naples	Istituto Comprensivo Statale 3° Gadda—Middle school (ages 11–15)	No man is an island
	Lugo di Vicenza	Istituto Comprensivo Statale Bernardino Nodari—Middle school (ages 11–15)	The Mediterranean dream—A trip through the Mediterranean
	Rome	Ente Nazionale Giuseppini del Murialdo (Engim)—San Paolo (ages 14–18)	Blue Heart
	Forlì	Istituto Tecnico Tecnologico Statale Guglielmo Marconi (ages 14–18)	W.A.Te.R.—What A Teal Renewal
	Alghero	Istituto Istruzione Superiore Enrico Fermi (ages 14–18)	Sea in a bottle
	La Spezia	Istituto Istruzione Superiore Capellini-Sauro (ages 14–18)	ML-CSA—Study the Marine Litter dispersion: Citizen Science Application case
Malta	Mellieħa	Maria Regina College Mellieħa Primary School (ages 10–11)	Sea life
	Birkirkara	St Monica School (ages 11–15)	Sea vegetable use in food preparation
	Birkirkara	St Aloysius' College Secondary School (ages 11–14)	Raising awareness on local fish
	Mosta	Maria Regina College Mosta Secondary School (ages 13–16)	*Kahooting* our way through the sea
	Tarxien	St Thomas More College Ħal Tarxien Middle School (ages 10–12)	Fishing—a way forward

Table 17.2 Detailed list of training workshops that took place during the BlueSchoolsMed project including objectives, activities and number of different participants

Title	Objectives and participants	Activities	Location and date	No. partners	No. educators	No. students
C1—Learning, co-building and training	**Objectives**: To set a benchmark based on previous experiences **Participants**: Partners and Teachers	- Presentation of project framework and the Ocean Literacy communities; - Sharing experiences with teachers; - Free expression space for teachers; - Defining expectations and outcomes (for project implementation, communication); - Sharing educational content and materials	Italy	6	6	–
			France (hybrid)	5	7	–
			Greece	5	5	–
			Malta	4	11	–
C2—Transnational training of student ambassadors and teachers	**Objectives**: To set prerequisites; To create links between the different countries; To define online tools and instruments **Participants**: Partners, Teachers and students	- Guided tour at the Cretaquarium; - Field work (beach); - Laboratory activities (Cretaquarium); - Public presentations (by students); - Guided visit of the Heraklion Archaeological Museum; - Peer to peer workshops	Greece (Crete)	10	23	20
C3—Transnational training workshop	**Objectives**: To summarize lessons learnt; To identify key messages and recommendations **Participants**: Partners, Teachers and students	- Visit the National Institute of Oceanography and Applied Geophysics (OGS); - Public presentations by students; - Games for all ages; - Peer-to-peer workshops - Guided tour at the Giant Cave; - Guided tour at the BioMa Museum; - Guided tour at the Miramare Marine Protected Area	Italy (Trieste)	12	20	28

For the second and third training events, funding was only available for a limited number of students. Based on the framework guidance, students that attended were elected in a democratic process within the classroom but also had to adhere to certain criteria. Besides being actively involved in the project, participating students had to commit to representing their schoolmates, present their school projects in public during mobility activities, and report back their activities when they return home.

During the second training event (C2) that took place in Crete (May 2022), the students worked on their projects alongside their Mediterranean peers and were encouraged to use artistic expressions to present their work (visual artwork, music and dance). Teachers and project partners discussed for the first time in person the lingering issues related to the project's objectives (Koulouri et al. 2022a). During the third training event (C3) that took place in Trieste (March 2023) where partners, teachers and students met to present the school projects' outcomes, evaluation boards were tested to gather feedback from participants on the spot. In both training events, host partners organized indoor and outdoor activities, including guided visits and beach workshops (Figs. 17.3 and 17.4).

17.3.3 Key Messages from the Activities' Implementation

The success of the BlueSchoolsMed project implementation was driven by key enabling factors. Central to that was the ability to generate interest in the educational challenge, effectively motivating teachers and fostering collaborations. Previous successful partnerships with institutions and organizations were leveraged, along with the use of best practice and lessons learnt. Teachers' existing expertise provided a solid foundation for achieving the project's objectives, while students expressed a heightened sense of agency through the assignment of roles that encouraged active participation. Additionally, the continuation of certain initiatives beyond the scope of the project supported sustained engagement and contributed to the development of a project-based community.

Fig. 17.3 Group photo following a beach activity addressing plastic pollution with students (Crete, May 2022)

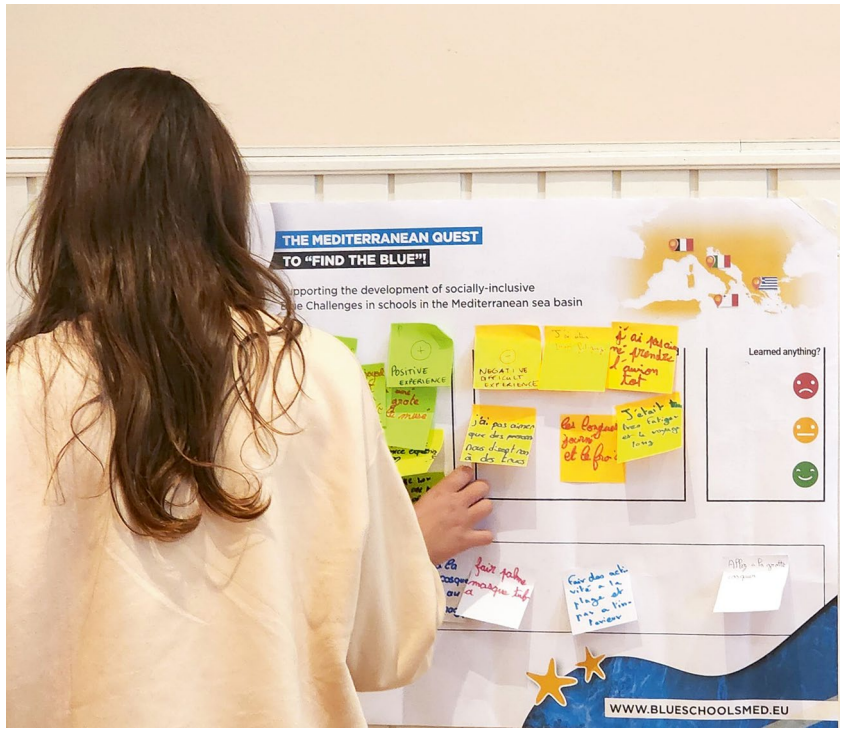

Fig. 17.4 Student adding her feedback on the evaluation board (Trieste, March 2023)

Notwithstanding these successful components, the project's full potential was hindered by a number of challenges. One of the main difficulties was adapting the existing school initiatives to fit the project's framework, timeline and working languages. Additionally, allocating sufficient time and space for OL activities within schools' schedules was complicated, especially during the COVID-19 pandemic. Primary schools generally found it much easier to integrate such activities as opposed to secondary schools. These constraints also further complicated the organization of mobility activities due to logistical challenges, bureaucratic hurdles, and the need for rapid adaptation to digital platforms for communication and project reporting. Other obstacles included navigating the differences across the four countries, namely regarding data protection regulations, the administrative procedures and permissions, as well as the varying degrees of flexibility in integrating OL within existing curricula.

17.4 Evaluation Phase: Assessing Impacts

Throughout the project, the pilot schools developed and implemented 19 Blue Challenges following the requirements of the NEBS and the guidance of the BlueSchoolsMed framework. Teachers and students also participated in several transnational training events organized by the project team. To analyze the impact and effectiveness of this approach, the project devised monitoring and evaluation tools for these pilot projects (Noon et al. 2023).

Three main evaluation tools were specially designed for this project and administered to the participants on different occasions and stages of the project and were coupled with teachers' personal class evaluation tools. The results will be presented in two parts: quantitative and qualitative analysis.

17.4.1 Quantitative Analysis

Two separate surveys were designed to target teachers and students, and they were distributed after the implementation of the Blue Challenges projects. Their content was translated and validated by a panel of marine scientists and educators, while descriptive statistics were applied to analyze the results.

17.4.1.1 Teachers' Survey

The teachers' survey included five sections, and a total of 81 questions. They consisted mainly of five-point Likert-type statements and open-ended questions to allow teachers to fully express themselves. Its four parts aimed to evaluate: (a) the context of the school projects' development, (b) the extent to which they responded to the initial framework's principles and guidelines, (c) the extent of the school project's impacts on students (and beyond), (d) the types of outputs produced and (e) the lessons learnt throughout the process. The surveys were shared through Google Forms.

Twenty-two teachers, the majority of which are working in primary education (54.5%) and teaching science and humanities courses, reported that their joint effort with the students highly achieved the pre-determined project principles, such as being sustainable, interactive and proactive, inclusive and democratic (mean values ranged between 4.27 and 4.41).

In regard to teaching methods, most teachers preferred employing multidisciplinary approaches, identifying challenges related to the sea, and organizing fieldwork activities (4.27, 4.14, 3.95, respectively; Fig. 17.5).

In terms of the impact of their "blue" projects, teachers positively rated the increase in students' knowledge and awareness of sea-related issues (4.64), their satisfaction with the projects' results, (4.59), the development of a sense of community within the classroom (4.45), and of responsible attitudes (4.36) (Fig. 17.6).

The results of the outputs produced during the implementation of the 19 projects were as follows: fieldwork activities (68.2%), creation of posters and videos/animations (63.6% and 59.1%, respectively), events (54.5%), artworks (45.5%), and educational tools (40.9%).

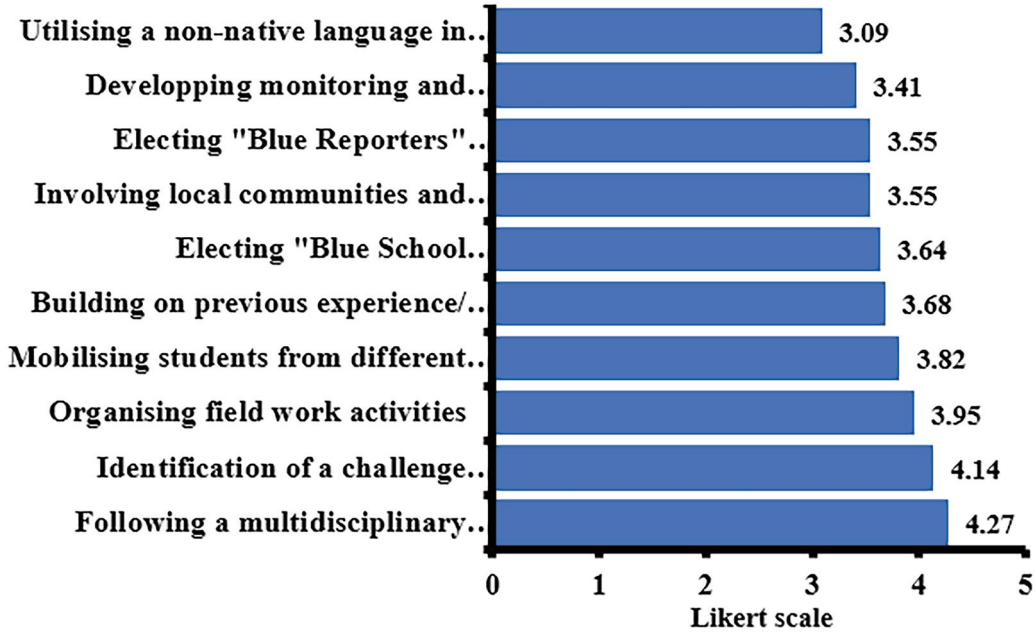

Fig. 17.5 Mean values of teaching preferences related to the sea as reported by teachers

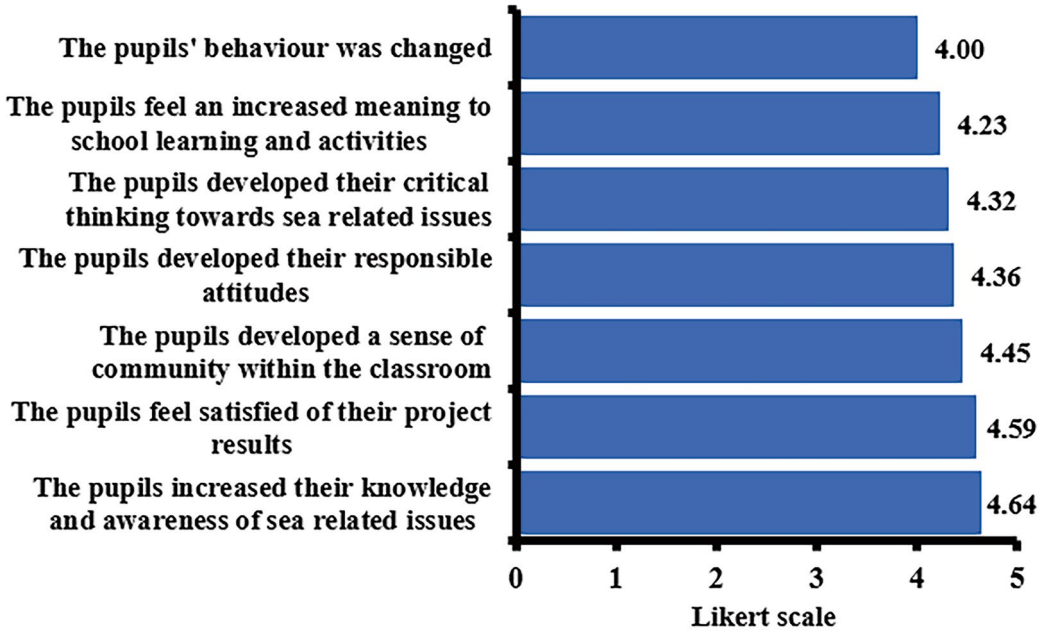

Fig. 17.6 Mean values of blue projects' impacts on students as reported by teachers

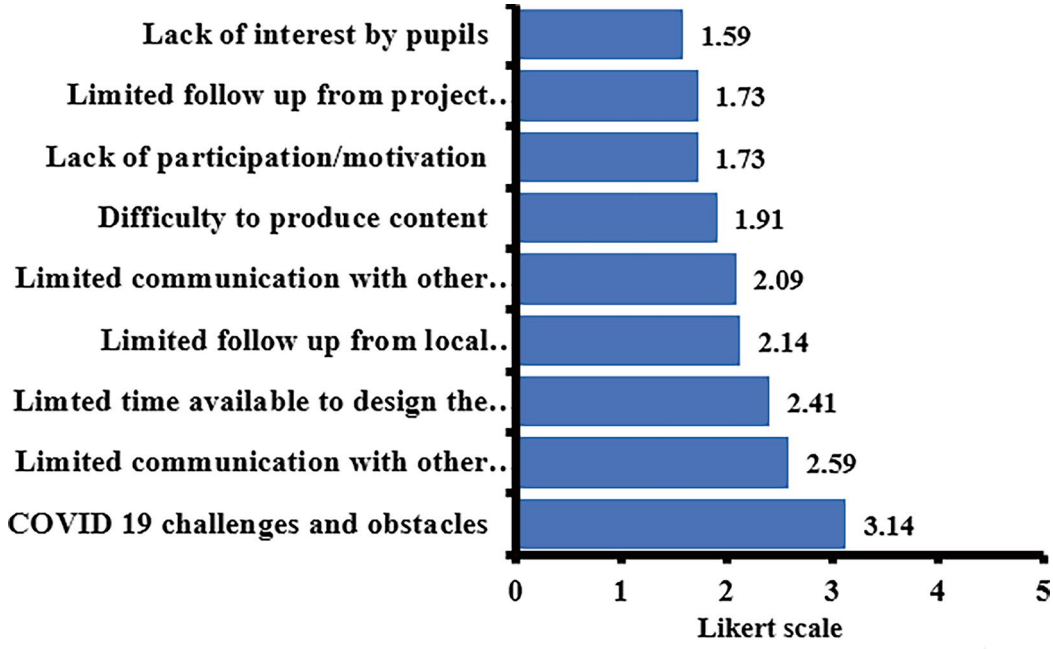

Fig. 17.7 Mean values on the challenges faced during the BlueSchoolsMed project as reported by teachers

All projects implementation faced several challenges, with the COVID-19 restrictions being the most important one (Fig. 17.7). Among the successful elements were the positive feedback received by students (4.59), the ideas and activities' originality (4.50), and the multidisciplinary aspect achieved (4.36) (Fig. 17.8).

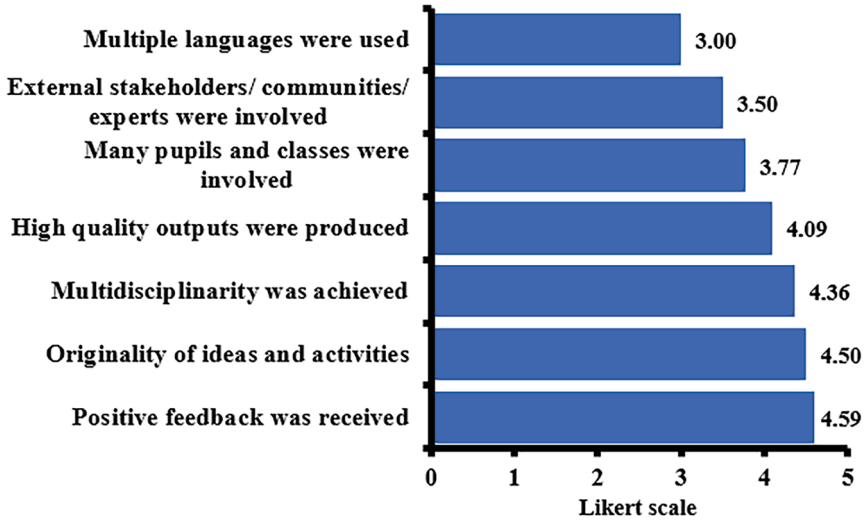

Fig. 17.8 Mean values on the elements that worked well during the BlueSchoolsMed project as reported by teachers

17.4.1.2 Students' Survey

The students' survey targeted both primary and secondary schools, and included four sections, and a total of 29 questions. These consisted of both closed and open-ended questions, five-point Likert-type statements, and a section for free expression.

The four parts aimed to evaluate (a) what students learnt, (b) what they think about certain statements, (c) what they do to protect the marine environment and (d) what they feel about marine related statements. The surveys were distributed in printed format for the younger students (primary schools) and in Google Forms for the older secondary level students. The wording used was simpler than the teachers' survey, with avoidance of jargon and technical terms.

In total, 230 students, aged between 9 and 19 years, participated in the survey from 18 primary and secondary schools, situated in 14 different cities within Greece, France, Italy and Malta. Slightly more than half of them were male students (53.9%) and about 83.7% of the students are living near the sea.

Just over half of the students (52.2%) had already participated in an activity about nature and the sea before this project. Students also stated that their teachers and the internet were their primary sources of information regarding nature in general as well as marine issues in particular (66.3% and 58.4%, respectively), and their favorite subject at school was Sports (44.9%) or Math (39.9%), while placing Civil Education (3.9%), Economics and Social Sciences (1.7%) last. It is worth considering that one of the reasons why social sciences and economics ranked low in this section is that primary schools were also involved in the survey, and these subjects are not part of their curriculum. Biology and Geography were deemed the two most important courses for learning about the sea, followed by History and Civil Education (Fig. 17.9).

The students were asked to express their feelings when thinking of the Ocean, and while working on the project. Regarding the former, they mainly felt peaceful and calm as well as happy and joyful (Fig. 17.10), while regarding the latter, happiness and joyfulness, along with fun and excitement, were the highest stated factors (Fig. 17.11).

After the end of the project, students reported increased knowledge of topics such as marine biodiversity, non-indigenous species, marine litter, sea currents and its physical/chemical parameters, etc. They also indicated improvements in their ability to collaborate with peers from other schools and countries and to share

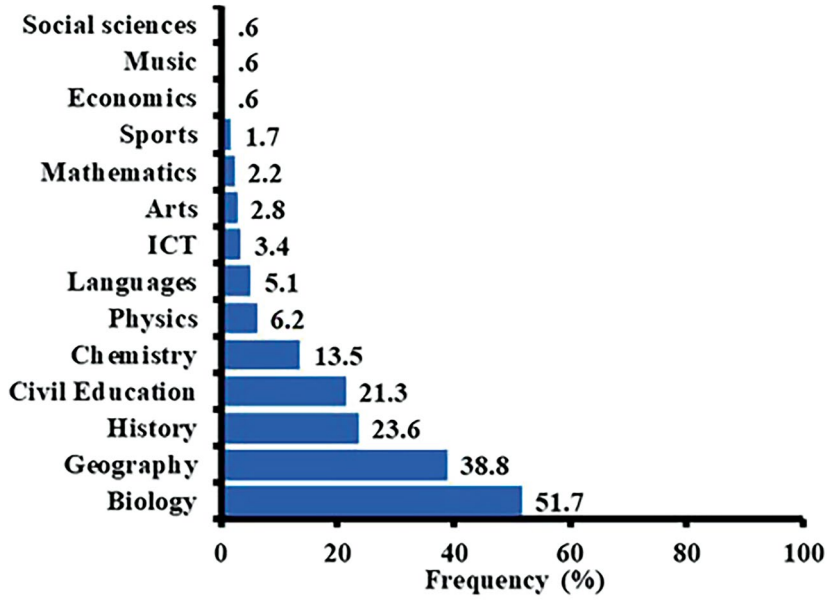

Fig. 17.9 Frequencies of school subjects teaching about Ocean issues

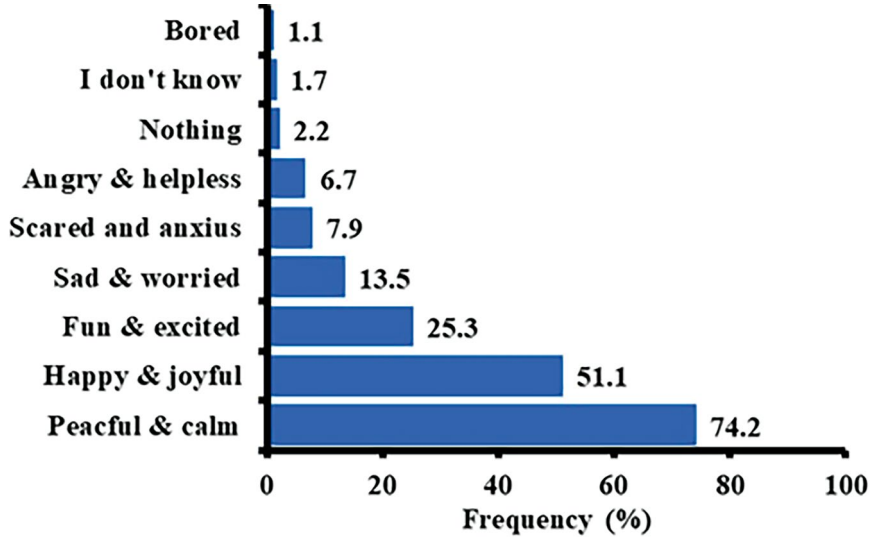

Fig. 17.10 Feelings expressed when thinking about the Ocean as reported by students

experiences across different contexts. In addition, students reported strengthened pro-environmental attitudes and more responsible behavior towards the marine environment, associated with an increased awareness of the vital role they can play as future active citizens.

17.4.2 Qualitative Analysis

Over the course of the three-year project, several transnational workshops and dissemination events were organized, involving both teachers and students from primary and secondary schools in a range of activities. To evaluate these events, the

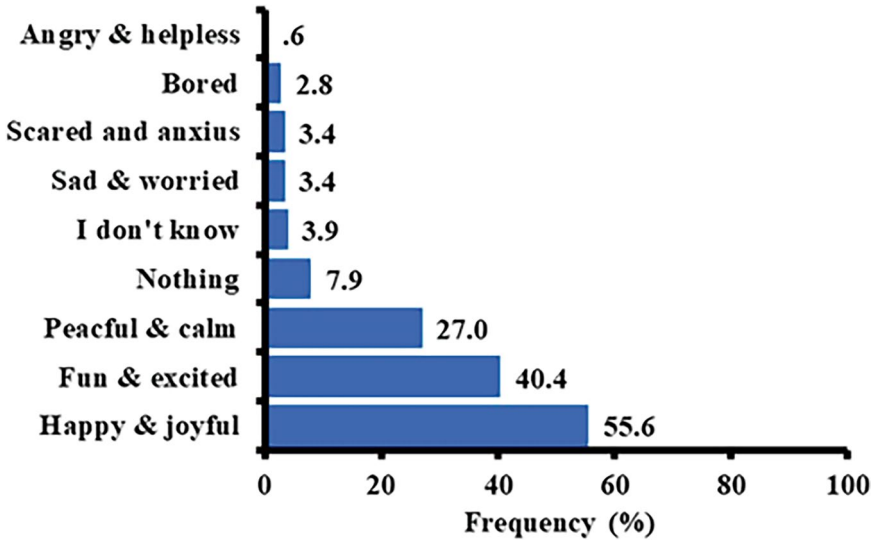

Fig. 17.11 Feelings expressed when working on the project as reported by students

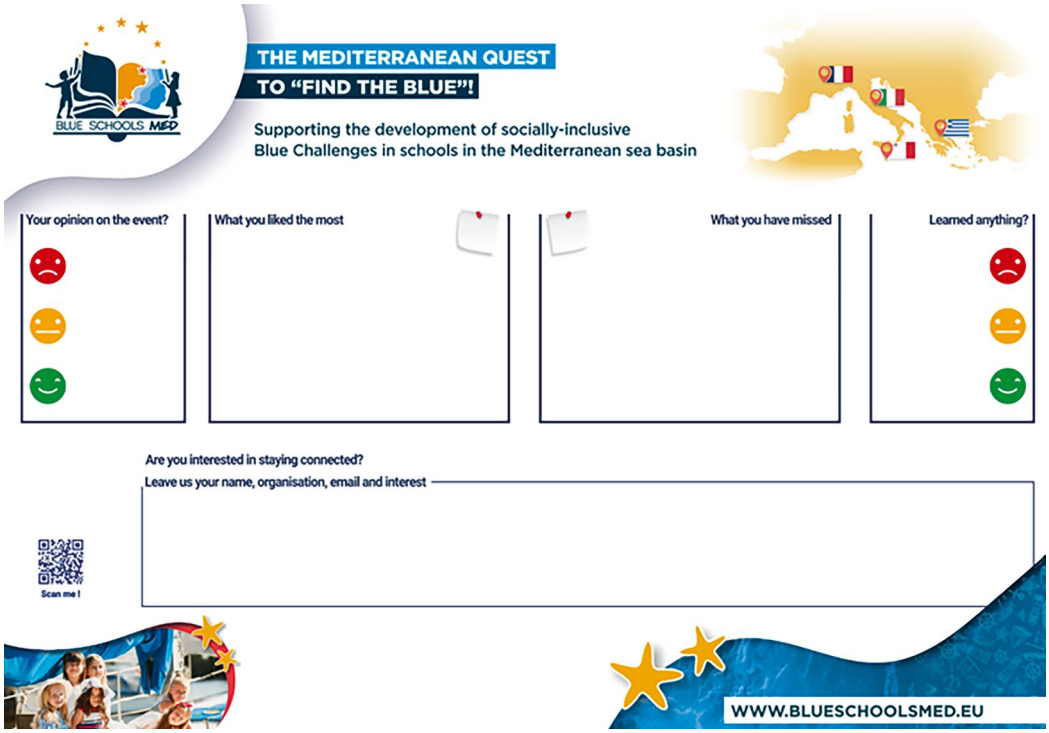

Fig. 17.12 Evaluation board sample used in in-person events and workshops organized by the BlueSchoolsMed project team

project team developed evaluation boards (Fig. 17.12) as a user-friendly qualitative and direct feedback tool. The boards featured simple and clearly formulated questions, and allowed participants to respond using post-it notes and stickers across five main prompts, providing immediate and interactive input. This approach helped the project team to identify which activities were per-

ceived as engaging, impactful and interesting, or conversely, less effective. In parallel, the team also drew on the assessments and feedback tools that teachers use routinely in their classrooms. Overall, results indicated a feeling of shared trust trust was felt by most of the teachers, although some expressed exceptional cases of limited follow-up from the project team.

Fig. 17.13 Drawing shared through the students' survey (6th grade student from Gournes school, Crete).

While EU national education systems have their own assessment rules for students and educational personnel, teachers also have the skills, the know-how and their specific methods to evaluate their students. This reflected trust in the teachers' existing methods and capabilities.

Many teachers agreed on the "Rubrics" methodology to evaluate the project's impact on students, and other innovative methods were also utilized, usually before and after the implementation of an activity to measure the difference (e.g., word clouds, drawings, writing exercises, presentations, etc.). The survey's final section offered the students a space for free expression through drawing and writing with sentences such as "*Life without plastic, is fantastic*!", "*I have the impression that I'm a multi-colored fish*" and "*This was an eye-opening experience, and it changed my perspective*" (Figs. 17.13 and 17.14).

17.4.3 Key Messages from the Evaluation Process

The BlueSchoolsMed project had a significant impact on both students and teachers. For students, the project facilitated reconnection with

Fig. 17.14 Word cloud generated from the student's survey based on topics that they would like to learn about in their next projects (words translated from all languages into English)

nature, allowing them to engage in sensory exploration of marine, coastal, and estuarine ecosystems through direct observation of marine life during field trips. They deepened their understanding of marine biodiversity through hands-on scientific experiments and laboratory visits, such as examining plankton samples using microscopes. This exposure enhanced their sense of responsibility toward the marine environment, particularly after learning about the various dimensions of marine protection. Students also acted as eco-citizens (supported by a successful example of Educational Marine Areas (EMAs) in France) and participated in beach clean-up campaigns. The projects integrated multiple subjects, including science, art, music, and geography, providing a well-rounded educational experience. Students were encouraged to express their creativity through artistic outputs such as music, dance, posters, and poems.

However, the evaluation revealed that students' knowledge of marine-related issues outside the formal curricula was limited, which affected the level of their pro-environmental attitudes and behaviors. This was echoed by several published research studies on students across the Mediterranean Regional Sea Area (RSA), including those by Cheimonopoulou et al. (2022), Koulouri et al. (2022b), Mogias et al. (2015), and Realdon et al. (2019).

Teachers, on the other hand, reported a high level of satisfaction with the project, as it helped them integrate Ocean Literacy (OL) into their teaching. Yet, they faced challenges related to adapting the project's framework to existing school structures, including time constraints, administrative hurdles, and varying levels of support for OL integration across countries. These challenges highlight their need for continuous support and recognition throughout the project.

As for the evaluation process itself, the experience provided valuable insights into its effectiveness. The project team noted the importance of establishing the evaluation process early on and communicating it clearly to educators to support alignment and transparency. Surveys were used at various stages of the project to collect both quantitative and qualitative data from students and teachers.

A key lesson learned was the need to tailor wording, content, and survey formats to the educational level of the students (primary or secondary), but also to adapt the expected outputs. Various factors, such as differences in educational contexts and language barriers, the number of students within each country and the age group highly influenced the results. As such, the project team emphasizes the need for critical reflection on the results and for reviewers to account for these influencing factors.

The findings from the mixed evaluation tools were first disseminated within the BlueSchoolsMed educational communities and key stakeholders, such as Ministries of Education, through national and international multiplier events (see next section). Beyond the framework of the project, the project team continues to share the lessons learnt to inform future OL initiatives and to ensure broader application and sustainability of the project's approach and an overall improved evaluation approach in future projects.

17.5 Dissemination Phase: Sharing Results

To mark the end of the Blue Challenge projects' implementation, dissemination events (referred to as multiplier events) were organized first on a national level (in France, Greece, Italy, and Malta), and later, an international level (Mediterranean). The objectives of these events were to showcase the activities and results of the BlueSchoolsMed project to other students, teachers and educational stakeholders of the four countries, and to work towards the widespread integration of blue education within their different curricular systems. (Table 17.3)

In the national events, the discussions prioritized the integration of students' perspectives into educational strategies, highlighting the importance of giving them a significant voice in shaping future educational frameworks. Additional covered topics included the importance of first-hand strategies and meth-

Table 17.3 List of multiplier events that took place during the BlueSchoolsMed project, including activities and number of participants

Multiplier event (ME) *(& location)*	Activities	No. of participants
French National ME *(France)*	Public presentations; World Café; Story telling pairs; Samoan circle discussion; Games; Theater show; Field activity in the local Educational Marine Area (EMA) of La Fausse Monnaie	13 partners; 7 teachers; 5 educators/scientific advisors/artists; 6 local stakeholders; 10 students; 5 parents
Greek National ME *(Greece)*	Public presentations; Hand crafts exhibition; Board games demonstrations; Digital application demonstrations	4 partners; 30 teachers; 20 students; 6 local stakeholders
Italian National ME *(Italy)*	Public presentations; Thematic workshops; Science fair	4 partners; 29 teachers; 20 students; 7 local stakeholders
Maltese National ME *(Malta)*	Digital tools demonstrations; Quizzes and games; Video screenings; Aquarium tour	8 partners; 16 teachers; 178 students; 14 local stakeholders
Mediterranean ME *(France)*	Panel sessions: - BlueSchoolsMed' process and results - BlueSchoolsMed' experience - Blue Schools examples and best practice - High level Blue Schools roadmap discussion Pupil activities: - Movie screening; - Workshops; - Speed meetings; - Student-led exhibition Guided excursions: - Educational Marine Area (EMA) of Frioul island - Guided visit of Cosquer Cave Museum	138 total participants including: 16 teachers; 89 students; 33 stakeholders

ods in scientific research and the formation of local community networks in synergy with the global landscape. The discussions also brought to light significant challenges, such as the necessity of more inclusive dialogues with students, enhanced support and recognition for teachers, and stronger interactions with policymakers to ensure the comprehensive incorporation of marine themes into national educational curricula. While the four countries' host institutions followed a unified agenda structure defined by the project coordinator, they also had the liberty to integrate different formats of workshops and educational activities (Fig. 17.15).

The Mediterranean event officially brought the project to an end, with a wide array of activities such as panel discussions, student-led exhibition, and outdoor excursions which took place over the course of three days.

Panel discussions between partners, teachers, experts, educational authorities' representatives and high-level speakers moved from the local level projects to the national ministries and educational representatives, going through Mediterranean RSA and EU and ended with a high-level international conversation. The discussion mainly addressed challenges and enablers for bringing the Ocean into classrooms, as well as targeted questions on the possibilities

Fig. 17.15 Theater of objects centered on the life cycle of a water drop, during the French multiplier event (Marseille, May 2023)

and roles of collaborations and networks on national, regional and EU scales. The sessions spotlighted similar OL initiatives from Egypt, Lebanon, Cyprus, Spain, and Finland, sharing experiences in spreading OL through various activities in different cultural, political and environmental contexts.

The two-day student-led exhibition displayed the three-year project outputs, where students presented the projects to participants through a "speed meeting" format. It was the highlight of the event as it reflected a high level of creativity and enthusiasm by the students, but also by external visitors (Figs. 17.16, 17.17, and 17.18).

Two excursions were organized during the event. The first one was to Frioul island, where one of the project's Educational Marine Areas is located (EMA St. Estève). The students from the local participant school presented their project and shared their learning outcomes (Fig. 17.19). The second guided tour to the Cosquer Cave Museum is noted for its pre-historic art and its unique geomorphology. These two trips exposed students and participants alike to diverse Mediterranean ecosystems and educational interventions.

While some logistical and organizational challenges were noted (linked to budget constraints, language barriers, safety of minors and travel issues), the event was deemed successful and useful by most participants. Key messages that emerged from multiplier events are integrated into the final section's recommendations.

17.6 Conclusions: From Challenges to Recommendations

The project's success was linked to several factors such as its international dimension, its experimental/transformative teaching methods and learning experiences, its multidisciplinary approaches as well as the promotion of (eco)citizenship, inclusiveness, participatory democracy and collaborative work. Rooted in a student-centric ethos and guided by Education for Sustainable Development (ESD), the project serves as a model for fostering empowerment and critical thinking among students.

However, the project implementation also faced its challenges. To begin with, COVID-19

Fig. 17.16 Board game designed by Italian students from Naples and presented at the Mediterranean Multiplier event (Marseille, May 2023)

was the first constraint that affected the entire project design, execution, budget utilization and mobility activities' organization. Aside from that, the different stakeholders experienced the project quite differently.

The project partners mostly struggled with administrative and bureaucratic issues while working with schools and throughout the events' organization, especially with traveling minors—a challenge that needs to be taken into consideration for similar mobility projects.

Teachers expressed limited confidence in addressing complex sea-related topics, but also an overall feeling of being undervalued. There was a sense of confusion amid the many EU education policies and rules, as well as communication difficulties linked to language barriers, which hampered the multi-cultural exchange opportunities among peers.

As for the students, there seemed to be a clear disconnection with nature, which was broken once they were on the field. Language barriers were also notable mostly among the younger students.

To better navigate such challenges, and to promote the enabling factors that drove the success of the project, below are some suggested recommendations aiming to support the successful uptake of Blue Challenges in Mediterranean schools (and beyond). They are the result of three years of exchanging experiences, raising debates, designing activities, facing challenges, organizing trips, events and training workshops and as well as collecting input from all project stakeholders. Recommendations cover several dimensions of the educational process, namely: (1) Policy, (2) Curriculum, (3) Teacher support, (4) Students engagement, and (5) Communication.

1. Policy. On a policy level, institutional support should be provided to build connections between formal and non-formal education entities (including research centers, scientists, academia, and national educational systems), as well as adequate school twinning and collaboration initiatives. In parallel, the Network of European Blue Schools (NEBS) could be

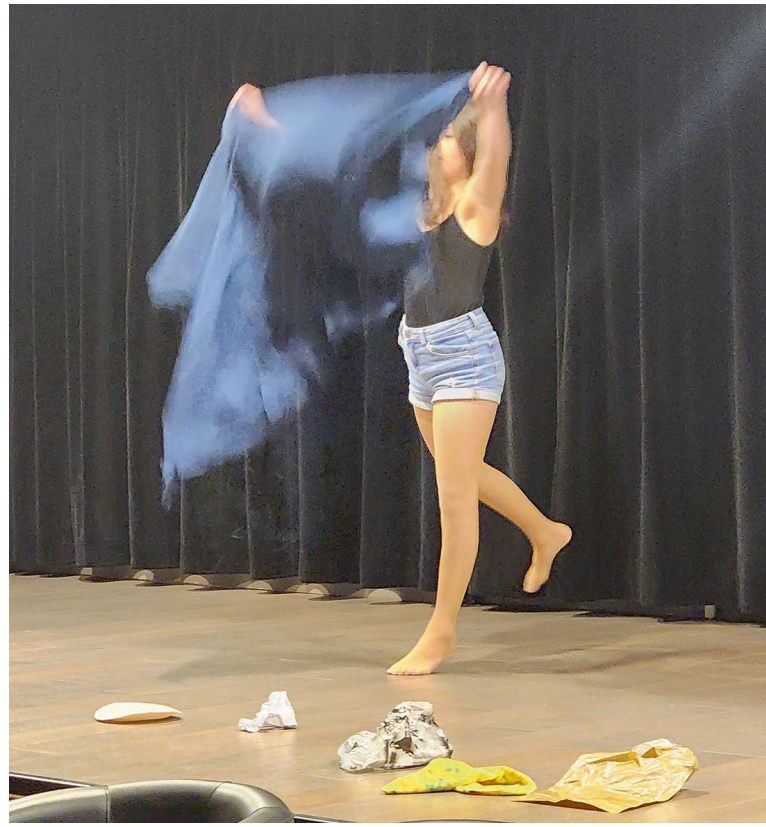

Fig. 17.17 Expressive dance by Greek student from Crete during the Mediterranean Multiplier event opening session (Marseille, May 2023)

strengthened through training opportunities, exchange programs, and funding mechanisms for multidisciplinary and international projects. Funding should be tailored to the receiving entity, and access/applications ought to be simplified to reduce bureaucratic hurdles. Formalizing these collaborations, through official agreements, for instance, will ensure effective teacher engagement, with funding and curricular recognition for the research partners and scientists involved. Within these agreements, clear expectations must be defined from both sides to ensure successful outcomes.

2. Curriculum. On the pedagogical level, several actions could be undertaken to render the curricula more inclusive of Ocean/environmental considerations. First, integrating, to the best extent, Sustainable Development Goals (SDGs) and Ocean Literacy (OL) into national school curricula as cross curricular themes (from kindergarten to secondary school), particularly SDG13 "Climate Action" and SDG 14 "Life under water". As such, marine topics would gain prominence alongside primary and other environmental education subjects. Experts are encouraged to take note of the different needs between primary and secondary school levels in terms of content development and pedagogical approaches. Moreover, a key recommendation is to promote cross-cultural exchange by increasing opportunities for collaboration between coastal/inland schools and across EU Regional Sea Areas (RSAs). The multicultural aspect of these projects could ultimately contribute to the joint conservation efforts of sea basins. Finally, the project fosters Open Schooling methods, where educational institutions partner and engage with families and local communities to enhance teaching and learning (Hazelkorn et al. 2015). This is accomplished by promoting flexibility, personalization, innovation, life-

Fig. 17.18 Students experiencing VR animations organized by Maltese schools in collaboration with the University of Malta (Marseille, May 2023)

Fig. 17.19 French student from Marseille explaining how to determine the seabed typology based on the visible shades of blue (Frioul island, Marseille, May 2023)

long learning (especially for teachers), collaborations, active participation and accessibility as a dynamic way to acquire knowledge, skills and values (Okada, 2023). This will ultimately lead to active citizenship in blue education, allowing teachers to freely experiment with various teaching and learning methods, according to their time and skills.

3. Teacher support. Teachers were the key driving force for achieving the project objectives and implementing/testing its framework. For that reason, giving them a voice and a space to express their needs was crucial, and became embedded in regular practice: they can be expressed in the following recommendations. First, it's important to provide targeted financing for school projects by facilitating access to EU, national and local funding opportunities, simplifying application and reporting procedures as well as ensuring that funds are reaching schools. Second, teachers need a supportive ecosystem around them. Creating a community of practice that brings together marine scientists and educators, NGOs, stakeholders and local communities in an educational network spread across territories can support teachers and students in their blue projects' development and implementation. Designing and delivering training programs for teachers in collaboration with research centers, universities and local networks is also recommended to enhance content knowledge, scientific methodologies and hands-on teaching. This will ultimately increase teachers' confidence in their capabilities to integrate Ocean related issues in their classroom. In fact, amid all the content being produced nationally and regionally, teachers require facilitated access to existing information and resources, which can be achieved by unifying online repositories where verified background knowledge is accessible and freely used to support teachers in their blue journey. Finally, helping teachers in the evaluation process by identifying evaluation metrics/indicators and by defining requirements once the project is closed.
4. Student engagement. Students are the project's main beneficiaries, and likewise, they are key to devising relevant and effective recommendations for future projects. What resonated the most with students is exploiting their natural curiosity by constructing a project with their interests in mind. Helping them rekindle their relationship with nature, focusing on field work and experimental activities proved to be a successful approach to help them retain information. Students also felt empowered by taking ownership of their blue projects and integrating digital tools or gamified elements to increase their engagement. Similarly, creating links with local communities by building/implementing the project with the help of families and friends, experts, and local stakeholders helped students to feel more engaged and committed to their local environment. This would serve as an introduction to eco-citizenship and as motivation to participate in similar initiatives beyond school hours.
5. Communication. In addition to implementing activities within schools, sharing outputs and results was a major significant outcome of the project. Communicating results in four countries and in five different languages presented its challenges. For this reason, overcoming language barriers could be achieved by using methods like games, interactive activities and performing arts to facilitate nonverbal cultural exchanges between the schools; by having interpreters at transnational events, especially to help younger students express themselves; and by integrating Ocean Literacy within English/foreign language school subject. Moreover, and to better transmit the knowledge, it is recommended to organize training courses, for both educators and students, on information/media literacy, journalism, science communication and content creation. Promoting collaboration between research centers and professional associations can improve their communication strategies and tools, fostering critical thinking about media, and developing content creation skills. This can subsequently contribute to a wider dissemination.

17.6.1 Summary

Key concepts explored in this chapter include:

- The BlueSchoolsMed project was built on international collaborations and a large network of educators, researchers and local stakeholders.
- The BlueSchoolsMed project combined traditional educational tools and Sustainable Development Goals to integrate Ocean Literacy into Mediterranean school curricula, in order to enhance students' understanding of the different marine environments, to foster eco-citizenship and to promote sustainable behavior.
- The BlueSchoolsMed project promoted the development of structured, multi/inter disciplinary and hands-on projects within Mediterranean schools to help teachers explore marine topics through multiple lenses. It encouraged the organization of fieldwork and outdoor activities, creative projects and peer-to-peer exchange to foster connection with nature while developing critical thinking towards the marine and coastal environments management.
- The BlueSchoolsMed project designed and tested evaluation tools tailored to teachers and students and included novel metrics (such as the emotional connection to the Ocean), and a space for free expression that added nuances to the quantitative results.
- The BlueSchoolsMed dissemination events provided a space for a student-led exhibition, which encouraged creativity, public speaking skills and decision-making roles within the schools. It also reached high-level representatives of ministries and international organizations to promote the integration of OL in national school curricula.
- The BlueSchoolsMed project team recommend simplifying funding application mechanisms for schools' projects, integrating sea-basin cross-cultural collaboration, increasing support and recognition for teachers, addressing language barriers for international exchange programs, and empowering students by encouraging leadership and agency within the classroom.

17.6.2 Recommended Resources

The following resources provide further insights and support on this topic:

- BlueSchoolsMed project website: https://www.blueschoolsmed.eu/
- Blue Challenges implemented throughout the project: https://www.blueschoolsmed.eu/wp-content/uploads/2023/05/blueschoolsmed-A4-projet-vF-web.pdf
- Example projects:
  - SeaChange: https://cordis.europa.eu/project/id/652644
  - ResponSEAble: https://responseable.acteon-environment.eu/
  - BlueLightS: https://blue-lights.eu/
  - ProBleu: https://probleu.school/
  - SHORE: https://shoreproject.eu/

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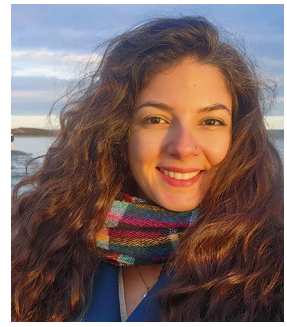

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