Schools for the Blue Economy (Blue Schools)

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Guide for Teachers

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BLUE SCHOOLS

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1. Introduction

The Blue Schools project aims to introduce Blue Economy to school education and support students to build a sustainable future in coastal areas and islands. This can be achieved through the development of educational resources and building synergies at local level.

People that live in coastal areas face a variety of challenges in their everyday life: Depopulation, marine and sea pollution, unemployment or seasonal and low-quality jobs, loss of traditional economic activities, like fishing etc. Most of these areas host a large amount of tourists during spring/summer time, which causes an overexploitation of natural resources and large amounts of waste, while in the winter time these areas are shrinked and struggling to survive.

1a. The Vision – Mission

The role of education in cases like this, is of major importance. Providing guidelines to teachers on how to present and integrate Blue Economy in their classes is one of the project's main outputs; Along with the *Conceptualisation of Blue Economy* (Intellectual Output 1) and the *Learning Resources for Students* (IO3), this *Teacher's Guide* (IO2) will offer the opportunity to schools of coastal areas and islands to transform themselves into Blue schools.

All project's IOs are interconnected, so in this *Guide* teachers will have the opportunity to explore and exploit *the concept of the Blue school and the Roadmap for the implementation of the Blue schools concept in the schools* already developed in IO1.

The necessity for developing the current document is based on the need of teachers to be empowered in order to shape the new idea in their school and to be able to pass the message, educate, teach and orient efficiently their students towards the Blue Economy. Teachers are Blue Economy's ambassadors in their schools and they deserve to be well prepared in order to impart to their students the knowledge and the skills to preserve their areas and support local labour market. Active citizenship of students is also one of the project's core objectives, that is why students (with the support of their teachers) will get in touch with relevant stakeholders and gain awareness in Blue Economy.

1b. The use of this material and its main idea

The Teacher's Guide is based on four (4) dimensions:

a) *The sea belongs to us*
b) *Dynamic sea*
c) *Discover and explore the sea*
d) *Sea and Humanity*

Project's partners coming from around Europe and mostly from the Mediterranean countries have realised that the above mentioned features can compose a useful guide for teachers in terms of distinguishing significant aspects of Blue Economy, establishing a concrete idea and eventually present it to their students.

The *Teacher's Guide* will additionally be the main material, based on which a European Competition will be organised, that will motivate schools to work on Blue Economy and focus on various aspects of it. During this Competition, School partners will present their projects and prizes will be awarded to the winners. Through this competition, an online network will be built that will bring awareness to local communities to build a sustainable future in their coastal areas.

1c. The Methodology - Lesson Plans

When this Guide was developed, the whole planet was facing the pandemic of COVID-19, so many people switched to distance learning and teaching, which will hopefully turn to a blended version of training/learning/teaching and after a while most of us will have become experts in presenting ourselves on line and in integrating digital tools with ease. As a result, this Guide has been changed several times, and has been formulated accordingly, in order to respond to the new era.

As you will be reading this Guide, you will discover that it is mainly Project Based Learning (PBL) oriented; not only because PBL supports interdisciplinary courses but also because it boosts creativity, critical thinking and problem solving. The latter are the top three soft skills that a person should have nowadays!

There are different suggested lesson plans, that will support Teachers in doing their Scaffolding and in developing their "Blue Economy lessons" in the most efficient and effective way.

1d. The resources

Various and mostly digital resources are available for you to seek for inspiration, decide which path to choose and make your lesson motivating, challenging and (why not?) joyful!

Happy navigation!

2. Analysing blue economy

Blue Economy, among others, consists of:

** blue energy*

** sustainable tourism provisions*

** fisheries & aquaculture*

** sea & marine activities (snorkelling, sailing, surfing)*

** ship building & recycling*

** maritime transportation*

** marine renewable energy*

** biotechnology*

** deep sea mining*

** desalination*

Methodology for mapping of the local area and data collection

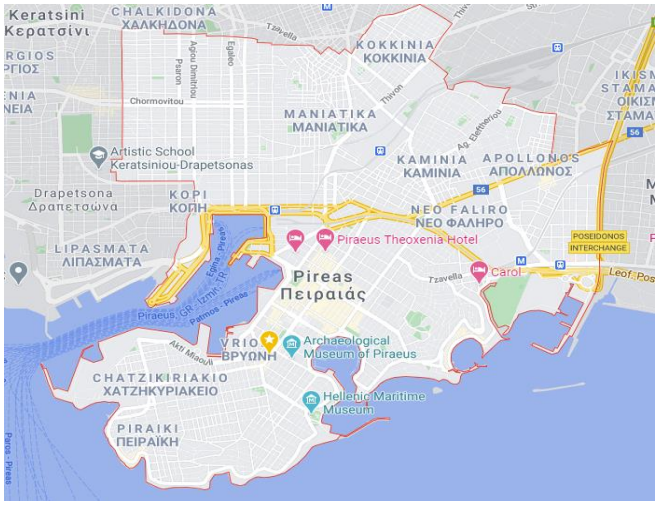
Mapping of the local area is the procedure of identification of actors involved in Blue Economy at local level and the tracking of their activities. Below, we present a step-by-step methodology for mapping your school's local area.

Step 1. Define the area

Which is your local area? Is it a municipality, city or region? Define the boundaries in a digital map.

Tip: *The local area can also be a neighborhood within a city or a municipality. You will define the size of your area, depending on the age of your students and the objectives that you want to accomplish.*

Example No1: Municipality of Piraeus, Greece



Example No2: The local area of our investigation is the city center of Catania, (Sicily) its Port and its Fish Market next to the Port.

Step 2. Define the scope of mapping

Define the scope of mapping at this stage. Questions to consider in this step are:

- Are you going to do a comprehensive mapping of your local area, or are you going to concentrate in some key sectors of local Blue economy activity?
- What is the main character of your area (touristic, fishing, port, industrial, etc)?
- Is there any local strategic plan for development that you want to focus on?

Then define the scope in one sentence.

***Tip**: You do the mapping of your local area, to accomplish your school strategy and objectives. You can do a general mapping or a very specific one, according to your own needs.*

Example No1: Municipality of Piraeus, Greece

The mapping covers the ports of Piraeus (the commercial, the passenger, the fishing and the yachting ones plus the beaches of Pireaus), organisations involved representing shipping, fishing, fighting against the sea pollution, NGOs, nautical museums, sea sports and sailing clubs, organisations preserving the sea environment etc.

Example No2: Municipality of Catania, Sicily

The mapping covers the area around the historical city center of Catania and explores the history of the city sea economy and maps some organisations involved with fishing, fisheries and shipping.

Step 3. Perform desk research

Make a preliminary desk research of your area and the Blue Economy sectors that you want to map. You can use information from:

- Historical and geographical books
- Documentaries
- Travel guides
- Local newspapers and magazines
- Biographies
- History fiction books and movies

Example No1: Pireaus, the second biggest port of the Mediterranean Sea, has 3 natural ports, one actually a passenger port connecting Pireaus to the Greek islands and a major stop for big cruisers, a smaller port with small fishing boats, sailing boats, yachts and small cruisers and a small one mainly for fishing boats. The commercial port, the main fish market, repairing shipyards and depolluting boats have moved to the west in

municipalities surrounding Pireaus. There are also 2 beaches and 3 Sailing Clubs. The *Nautical Museum of Greece*, the *Liberty Boat Museum* and the *Laskaridis Museum* are open for visits, whilst the Museum of the nautical archeological findings is under construction. A lot of activities and organisations deploy around these ports.

Example No2: The Catania fish market is located in the heart of the city adjacent to the historical city center and its Port. The entrance to the Catania fish market is located just behind the Amenano Fountain, a Baroque Carrara marble fountain that takes its name from the Amenano river that had once flowed on the same spot. It was created to adorn the market square in the 1800's. The city's economy has always been based on fishing and the fish market has represented both in the past and still today the beating heart of the city's fish trade. The hectic bustle of the famous market is a must-do-attraction in Catania. It is one of the largest fish markets in Sicily and many books, travel guides and articles have been written about its colourful and smelly atmosphere.

Step 4. Map the local stakeholders

Write down the local stakeholders involved in Blue Economy and/or the selected sectors of Blue economy. Indicative sources of information could be:

- Chambers of commerce, industry, crafts etc. Chambers usually maintain a record of their members and can be a valuable source of information for businesses, operating in your area
- Registration offices of businesses and organisations
- Online business databases
- NGOs, Foundations and organisations involved in Blue Economy sectors

The mapping could have the following format:

Tip: *Adjust the table to fit your own needs. Select some key actors for the interviews that will follow.*

A set of questions that could lead this research:

- *What is the most important maritime economic sector in your region, department or port …?*
    - *What are the key companies of this sector ?*
- *What are the traditional activities?*
    - *What are the representative organisations ?*
- *Are there marine protected areas, nature reserves, marine nature parks?*
    - *Who manages them?*
- *Which state or local authorities have jurisdiction over the marine environment?*
    - *Is there a department, a skills hub for marine research?*
    - *Who are its representatives?*
    - *Are there other organizations in charge of the blue economy?*

sector	company name / address	activity	connection to blue economy

And here you have some examples from countries around Europe:

sector	company name / address	activity	connection to blue economy
shipping industry	MAIMPORTVIA CARDINALE DUSMET, CATANIA SILOS AGRARIO **Catania**	Shipping Shipping	Yes Yes
coastal tourism	B&B Palazzo Bruco, **Catania**	Lodging Establishment	Yes
fisheries	Ittica Costanzo, **Catania**	Fish Market	Yes
Transport of goods, passengers	Moby Lines Corsica Linea Corsica Ferry La Méridionale	Private Company	Long-distance passenger transportation (France-Corsica, Corsica Italy, etc.)
Port activities (commercial port…)	Chambre de commerce de **Corse**	Private Institution	Management of the port activities
Professional fishing		Professional Association	Management of the professional

Aquaculture and marine farming (Shellfish, seafood, algaculture…)	Comité Régional des Pêches Maritimes et des Elevages marins de **Corse** Prud'homie de Pêche	Public body	activities of fishing and marine farms
Marine Protected Areas and Marine Natural Park and Environmental Protection	Parc naturel marin du Cap Corse et de l'Agriate Réserves naturelles de: l'étang de Biguglia, Réserves naturelles Scandola, Réserves naturelles des îles Cerbicale et Finocchiarola, Réserves naturelles des bouches de Bonifacio Centre Permanent d'initiative à l'Environnement de **Bastia**	Public body Association	Protection of the environment Awareness and education of the marine environment
Marine research Center	Stella Mare Stareso	Private institution	Marine research
Public co-operations dealing with sea issues	Office de l'Environnement de Corse	Public body	the development, management, animation and promotion of the natural heritage of Corsica.
Maritime affairs	Ministry of Maritime affairs and Insular Policy https://www.ynanp.gr/en/	***Hellenic*** *ministry* Public body	
Shipping	https://nee.gr/en/	*governmental organisation*	**Hellenic** chamber of shipping
shipping	**Hellenic** institute of nautical technology https://www.elint.org.gr/	NGO	Promoting technological changes in shipping
shipping	HELMEPA https://www.helmepa.gr/en/?view=default	NGO **Hellenic** Marine	the pioneering voluntary commitment of Greek seafarers

		Environment Protection Association	and ship owners to safeguard the seas from ship-generated pollution
Environment & waste management	AEGEAN REBREATH https://www.aegeanrebreath.org/en/	NGO	collecting, recycling and upcycling of marine litter
Tourism	Yes-forum.com	Platform of open dialogue about sea tourism	a European network of 40 NGOs from 19 EU member states that support sustainable tourism around Europe
Research	**Hellenic** centre for marine research https://www.hcmr.gr/en/	governmental research organisation	operating under the supervision of the General Secretariat for Research and Technology (GSRT) of the Ministry of Education, Research and Religious Affairs
Environment & waste management	Mediterranean SOS http://medsos.gr/medsos/	Environmental NGO	Seeking for solutions to environmental problems in EU level
Shipping	Union of **Greek** Shipowners https://www.ugs.gr/en/	Shipowners initiative	Represents Greek-owned commercial vessels
Tourism	Visit **Greece** https://www.visitgreece.gr	website	Official website promoting Hellenic tourism
Environment & waste management	**Hellenic** society for the protection of nature https://www.eepf.gr/en/project/su	NGO	Supporting actions related to sustainability

	stainable-development-programs/blue-flag		
Maritime culture, museum, maritime library	Laskaridis foundation http://www.laskaridisfoundation.org/	NGO	Training programmes, lenting books, recycling of fish nets to produce modern furniture
Preservation of sea life	Archellon Archellon.gr	NGO	The sea turtle protection society
Museum	**Hellenic** Maritime Museum Hmmuseum.gr	State-run	History of the connection of Greece with the sea, different types of ships
Museum	Floating museum "**Hellas** Liberty" https://www.greekshippingmiracle.org/	Corporate Foundation	Commercial marine contribution to the 2nd World War and the miracle of development of the Greek commercial marine
Secondary school	Nautical school of Piraeus http://9epal-peiraia.att.sch.gr/autosch/joomla15/	Public school	Maritime education
ADD OTHERS			

Step 5. Perform a field research

Once you have identified the companies and organisations related to Blue Economy and/or selected sectors in your area, organise some interviews, to get more insight information on their activities.

Some indicative questions and answers to local stakeholders could be:

- Is your organisation related to or involved in Blue Economy activities?

- If so, do you have a success story to share?

- Is your company producing or dealing with anything that could be related to Blue Economy or Blue & Circular Economy (e.g Marine Plastic Waste) ?

- Can you identify or suggest some other stakeholders that could support Blue Schools project?

- Have you ever worked with school teachers (if the interviewees are entrepreneurs) ?

- Have you ever worked with entrepreneurs (if the interviewees are school teachers) ?

- How can this information be exploited?

- ✓ For the creation of a Blue Network
- ✓ For the reinforcement of local coastal communities regarding Blue Economy
- ✓ For the engagement of relevant stakeholders and the creation of synergies between them and local communities

***Tip**: Develop your own questions, to map your area. Involve your students.*

Example No1: **Welcome to the Port of Piraeus**

Piraeus has been, since the antiquity, the port of Athens. Its importance was ever since great, as Atheneans based their wealth on their commercial marine, their power on the famous battleships triremes and their coalition with Aegean sea islands and even their existence to the naval battle of Salamis where they defeated the Persians.

The port of Piraeus, or more correctly the ports of Piraeus are actually bustling with a variety of marine-related activities. There are the headquarters (along with the City of Piraeus) of some of the biggest shipping companies (Greece is being one of the biggest shipowning countries in commercial ships), a big transit hub for bulk merchandise and containers coming from all over the world, an entrance gate for the EU, connecting through the passenger port the Greek mainland with the islands, having small shipyards, depolluting companies, supplies and provision of services to ships. On the other hand it has a lot of sporting activities such as rowing & yachting clubs, water polo ones, and it the home for Olympiakos F.C. There are a lot of touristic boats and yachts as well as big cruisers.

Fishing is also an activity practiced both by professionals and amateurs in the wide area.

Example No2: **Welcome to the Port of Catania and its Pescheria**

***Source**: https://www.greenme.it/vivere/arte-e-cultura/ombrelli-pescheria-catania/*

Located in the centre of the Mediterranean Sea and with a total surface of 615,000 m2 today the Port of Catania is one of the most important ports in Sicily and home to a variety of different activities: a tourist and commercial port with national and international connections provided by major shipping companies. With the objective of becoming a modern "water- front", that is part of the city, the Port is a meeting point that hosts business and cultural activities. Near the Port of Catania is the historic fish market, a place of unquestionable tourist attraction as it represents a true hymn to one of the most ancient economic resources of the city. From the early hours of the day the hawkers set up the counters proudly displaying the fresh catch with varieties typical of the Catania backdrops: spatulas, masculine or anchovies, swordfish, tellines and squid. Local housewifes, entire families, and elderly pensioners jostle through the crowds

perusing the merchandise and looking for the day's bargain. The fish market is lively, boisterous, colourful and gritty with an exhilarating atmosphere. If anything sums up the beating heart and soul to Catania, then it's this place, full of the life and as down-to-earth as the locals themselves.

3. Features of a Blue School and how to proceed towards it

As it is already mentioned, this Guide is based on 4 different elements/aspects:

a) *The sea belongs to us*
b) *Dynamic sea*
c) *Discover and explore the sea*
d) *Sea and Humanity*

In the following we give some examples of aspects a school may use to introduce school students to the concept of the Blue school:

a) **"*The sea belongs to us*"** or should we say **"*we are all part of the sea*"?**

Suggested school activities to be developed in this dimension:

- Field trips to archipelagos in the school area, e.g. The Berlengas Archipelago in Portugal;
- Beach cleaning activity with the support of Coastwatch, chemical analysis of the waste gathering. During the activity there will be fauna watching and coastal landscape sightseeing;
- The importance of the sea from different point of views (socially and personally);
- Bringing students and the community closer to the sea to strengthen ties;

In 2018[1], the total value of the EU's imported and exported goods transported by sea to non-EU countries was EUR 2 006 billion. Sea transport accounted for 47% of goods exported and 55% of goods imported. The second most common way of transporting goods was by air (30% of EU exports and 21% of EU imports). Road followed with shares of 18% for exports and 14% for imports, and rail with 1.2% and 1.4% respectively. Comparing 2018 with 2002, sea was the mode of transport for EU trade in goods that increased the most.

[1] https://ec.europa.eu/eurostat/web/products-eurostat-news/-/EDN-20190926-1?inheritRedirect=true

What is presented here is the undoubtful case of sea's major value to innumerous human activities. What is also known is the beneficial role of the sea in people's evolution and progress while the latter are causing big problems to the sea sustainability.

The Blue school project is approaching the term of Blue economy and aims to present to students all aspects of sea protection as well as ways to support coastal sustainability and gentle exploitation.

"The sea belongs to us" could be easily transformed to "we are all part of the sea". One of the famous Ocean facts is that "*The ocean covers more than 70 % of the surface of our planet". According to U.S National Ocean Service, "about 97 % of the Earth's water can be found in our ocean*[2]*".*

Around the Globe's oceans there are many other interesting things that are inevitably related to the sea overexploitation and perhaps not so many people have thought about it. One example is from the Mediterranean Sea and this time our source is from **Archipelagos**[3] **- Institute of Marine Conservation**, based in the island of Samos, (Greece), at the east part of the Aegean Sea, where it is written that:

- 1.000 alien species[4] are found in the Mediterranean
- 650 alien species have viable populations
- 100 are invasive and threaten marine biodiversity

Scientists need to have access to such important data regarding the distribution of these species, since the latter could have adverse effects on ecosystems, fisheries and the health of our seas in general. Keeping a record of the sea fauna, with the contribution of everyday people, is what actually builds the *Science of Citizens - citizenscience*, which is an invaluable source of information about biodiversity and sea threats.Together we can and must work and exchange information so that not only can we understand but also survive in our changing seas.

According to the above mentioned elements, it is easy to realise what people can do when they cooperate for the common good and this is what the Blue School project is trying to showcase: the need for children to work together and discover the power of collaboration under the umbrella of sea sustainability. Under this framework they could learn how to do simple research, how to measure sea pollution's impact for their everyday life and eventually create a network (with the guidance of their teachers) that will strengthen the bonds between islands and coastal areas' schools around Europe.

Students could also implement some hands-on activities, such as cleaning a beach, collect microplastics, examine or observe them in the school lab and report some interesting facts about the different kinds of them; students could also involve

[2] https://oceanservice.noaa.gov/facts/oceanwater.html
[3] https://archipelago.gr/en/
[4] As the names imply, these species do not belong to ecosystems in which they are either intentionally or unintentionally placed. They tend to disrupt the ecosystem's balance by multiplying rapidly. These species are often plants, fishes, mollusks, crustaceans, algae, bacteria or viruses. https://marinebio.org/conservation/marine-conservation-biology/biodiversity/alien-species/

themselves in 3d-printing (out of sea waste) or in creating artworks out of this garbage (before or after recycling them) or even check flora and fauna's change (or mutation) throughout the years by comparing a specific coastal area with the use of pictures or testimonials .

b) Dynamic Sea

Suggested school activities to be developed in this dimension:

- Focusing on the renewable energies, i.e In Portugal, there will be a field trip to the «Centro de Alto Rendimento de Surf in Peniche», where in the room «Centro de Interpretação Ambiental» a special project stands out, "Simple Underwater Renewable Generation of Eletricity" – SURGE, a project that promotes the production of electricity through the natural movement of the waves;
- Practising water sports (surf, sailing and canoeing, depending on the weather conditions or on the availability of some of the local entities);
- World Surf Championship - a source for local income

Sea in dynamics

The sea is defined as a vast expanse of salt water, distinct from the oceans by its smaller size, and most often characterized by continental shelves. It is also a space common to different States and the center of many human and commercial exchanges.
For example, the Mediterranean Sea is the origin of several civilizations.
In fact, many human activities, both old and new, are carried out there.
The oldest is the professional fishing. Together with agriculture, it represents one of the oldest human activities. If ports now pool many activities (transport of goods, passengers, boating, shipbuilding ...), they were once only fishing ports.
Issues in the professional fishing industry : Each year the fish resource is decreasing to the point of worrying its disappearance. The FAO estimates that more than 90% of Mediterranean fish stocks are exploited at unsustainable levels.
Artisanal fishing, practiced on small boats of less than 12 meters, is aging mainly for the northern shore of the Mediterranean. Here too, there is a worry of the loss of a human heritage if new generations of fishermen do not take over from the old ones.

Recreational activities such as boating, recreational fishing and water sports represent an important part of the human and economic activities. These activities are

often linked to tourism, i.e. they are practiced in recreational moments. However, they include several companies in the ports management, vessels construction, equipment, etc…

Issues in the field of the recreative activities : there are more and more human activities .The negative consequences as pollution and plastic wastes are crucial challenges. The natural spaces are more and more troubled by the human presence. Several Protected Marine Areas have been created (regional, national parks, marine reserve…) in order to limit these impacts and preserve the fauna and flaura.

The renewable energies are the activities of tomorrow. The new innovative technologies offer numerous and new sea activities. The sea resources can be exploited to produce new energies, medicine, proteins… In example, it is possible to produce electricity through wind turbines exploiting streams power. Algae are the base of new foods and cosmetics products.

Problem : the sea is a fragile space and has to be protected. The exploitation of these resources must not lead to the destruction of its marine ecosystem. For example, the sea and the oceans are acidifying due to greenhouse gases produced by human activities that endanger its biological balance.

Sea Weeds

Seaweed farming is the practice of cultivating and harvesting seaweed. It is normally farmed in Japan, China and the Republic of Korea.

[*Species grown include Gelidium, Pterocladia,Porphyra and Laminaria*.]

Seaweed farming was promoted as an alternative to fishing in order to offer an additional source of income to fishermen. Nowadays, not only is a source for food but it is an export commodity and used for the production of agar and carrageenan products.

Agar is an ingredient in desserts and may be used for microbiological work. It is a laxative, an appetite suppressant, a vegetarian substitute for gelatin, a thickener for soups, in preserving fruit, ice cream and also used as a clarifying agent in brewing.

Carrageenans are compounds extracted from seaweeds and used in the food industry due to their gelling, thickening and stabilizing properties and are mainly used in dairy and meat products, due to their strong binding to food protein.

Global production of farmed aquatic plants, overwhelmingly dominated by seaweeds, grew in output volume from **13.5 million tonnes in 1995 to just over 30 million tonnes in 2016 with China and France dominating production. As of 2014, seaweed was 27% of all** marine aquaculture[5].

Seaweed farming is a carbon negative crop, with a high potential for climate change mitigation.

[5] https://en.wikipedia.org/wiki/Aquaculture

Seaweed farming began in Japan as early as the seventeen century in Tokyo Bay by throwing bamboo branches into shallow water where the spores of the seaweed would collect and eventually seaweed would either grow in site or the bamboo branches would be transferred to a river estuary where nutrients were more readily available. In the twentieth century, nets tied to bamboo poles would be used or simply ropes tied on the bamboo poles. Cultivation of seaweed started in the late twentieth century when demand for seaweed increased.

Seaweed farming has spread beyond Japan in the late twentieth century beyond Asia and is now common in North America and Europe. It is currently under the spotlight of environmental research due to its capacity and potential to assist in mitigating efforts for climate change.

Cultivation of seaweed remains a relatively low-technology business and in shallow waters with a high labour requirement. The introduction of high technology for cultivation purposes is being tested with no commercial viability yet.

Environmental and Financial Consequences

Seaweed farming may however negatively affect the quality of the water by the removal of some specific plants in the area of the farming such as mangroves or eelgrass.

On the contrary, the preservation of coral reefs may be assisted by seaweed farming via the provision of algae and food for some fish species and shelfish. Seaweed and harvesting shellfish may also absorb excessive nutrients (Nutrient bioextraction) such as nitrogen from natural water bodies. Research is ongoing for large scale seaweed cultivation in the open sea in order to absorb large quantities of carbon oxides (Carbon sequestration) to assist the reversal of climate change.

In Japan alone, the production of **Nori** (edible seaweed-sushi wrapping), is estimated to be worth of nearly 2 billion USDollars, in addition to the employment opportunity that the industry offers. In Tanzania, seaweed farming for skinware and the cosmetics industry, employs mostly women and it is the third largest contributor to foreign currency in the country.

(Recommended Read: giant kelp or macrocystis pyrifera).

*[**Extra Activity:** (Voluntary) Suggested student presentation on the effects of CO2 as a Grean House Gas (GHG) for global warming and efforts to capture and store it (Carbon Sequestration)]*

Farmed seaweed is used either as food (edible seaweeds, high fiber), or as a source materials for things like biofuels, or as ingredients in the pharmaceutical or the cosmetic industry (medicines, shampoo, soap production) or for the extraction of polysaccharides such as **Agar** and **Carrageenans**.

c) Discover and explore the sea

Suggested school activities to be developed in this dimension:

- Field trips to visit institutions whose work and income is taken from the ocean and aim to preserve its natural resources;
- Visiting Fishing Ports;
- Learning more about Marine resources & Micro plastics;
- Organise/participate in experimental marine activities;
- Discover Aquaculture

To 'discover' is to see, to gain knowledge of something previously unseen or unknown, to learn of or to find out.

To 'explore' is to look closely onto something, or an area, to study, to scrutinize, to examine, to investigate and learn something new, that is for the purpose of discovery.

Marco Polo travelled from Europe to Asia between the years 1271-1295 A.C and he was the inspiration of many other explorers, including Christopher Columbus. He travelled extensively in the Middle East and Africa between 1405 and 1433 and exchanged goods such as gold, porcelain and silk. Henry the Navigator led expeditions across the Atlantic Ocean and along the western coast of Africa, and colonised the Azores and Madeira islands. Christopher Columbus sailed across the Atlantic in four trips to discover the "New World", between 1492 and 1504. In 1497, the Portuguese explorer Vasco da Gama set sail from Lisbon towards India. His voyage made him the first European to reach India by sea, and opened up the first sea route connecting Europe to Asia. Robert Ballard (TITANIC-1985, Bismarck-1989) still explores the depths of our seas. Exploring and discovering will continue as long as there are humans on Earth curious to find out, to seek and to learn.

The first evidence of sailing in Mediterranean Sea was from the original ancient sailors, the Phoenicians. After that and during the Minoan age, Minoan traders from Crete, were active in the eastern Mediterranean by 1600 BC trading copper and bronze. All the ancient civilisations have their own story of seafaring, exploration and trade routes. Part of the charm of sailing in Mediterranean Sea and especially in Greece is that the ancient history is evident everywhere in all sailing routes.

3.1-The Undiscovered Sea

About 70% of our planet is covered by the sea the majority of which is waiting to be discovered. The seabed of the sea resembles the earth which we see above the sea level. It contains mountains, volcanoes, canyons and is inhabited by species still unknown to us.

Explore, map, collect data and share. Scientists have been doing that for the overall benefit of mankind. Share freely and let others use the information. The discoveries will eventually be surfaced unexpectedly.

3.2 - Coastal Archaeology

The coast presents a potential for the development of archaeology. Although it is a difficult environment for preservation and access, the coast is a natural boundary and perhaps the most obvious boundary where maritime cultures dared to cross, in order to explore and discover new worlds. It is the bridge between terrestrial and maritime lives and therefore an undiscovered area where ships and their cargoes departed or imported or lost at sea, cultures were created and sailors and their families lived.

Terrestrial and underwater archaeology alone cannot complete and tell the puzzle of humanity unless they are accompanied by coastal archaeology for a fully developed and unified maritime archaeology.

Coastal archaeology, although never defined in limits, due to its ever changing nature, it may be considered as a 'moving target', and may be left to each culture in association to its morphology to estimate its bounds. In Scandinavia, coastal sites may be found hundreds of kilometers inland whereas in the Meditteranean, once ports of the past may be found under the sea due to tectonic movements.

The evidence of early coastal civilizations is in abundance but however their discovery is burdened by changes in sea levels and extremely difficult ground topography to assist easier identification and exploration.

In addition to natural changes in the coastal environment, anthropogenic influence and inhabitants provide an additional level of complication. The main concern for coastal archaeology is the natural phenomenon of erosion. While sea levels rise, erosion may destroy archaeological sites forever. There is currently an estimate that 500 sites and historical sites around the United Kingdom may be destroyed for ever in the next 100 years due to natural processes.

Erosion is caused by wave actions on the coast, but coastal sites also face damage due to ice damage, storms, and of course increased coastal development (expansion of cities, ports etc). Please bear in mind that approximately 60% of the world population lives within 100 km of the coastline.

[***Extra Activity:*** *Voluntary presentation of adding/estimating the population of major coastal cities in your country and comparison to the overall total population of the country.]*

Preservation of coastal sites is dependent and threatened by both natural and human related factors. Coastal Archaeology is therefore an urgent and important issue for the pursuit of knowledge and historical mapping of humanity and its related activities.

Q. *What constitutes an archaeological site? A port of the 11th century A.D. or a shipwrecked during World War II?*

"An Archaeological site is any place where there are physical remains of past human activities. Prehistoric are those without a written record."

Time is not a parameter in the definition of an archeological site. Archaeology analyses the physical remains of the past in pursuit of an understanding of human culture, and might include a 3000 year old submerged city or a 40 year old scuttled submarine or naval ship. Historical archaeology occurs when writing may be used to aid research and understanding of the historical site in question. Archaeological sites include villages, cities, quarries, rock art, ancient cemeteries, megalithic stone monuments, either submerged or in land.

Underwater archaeologist have tended to focus on ports and beached shipwrecks. Few nations have started investigating sites that are both above and below sea level in order to connect the findings.

Many historic people who lived near the coast, moved freely from agriculture to maritime occupations including fishing and trade. Farmers, fishermen, hunters and sailors recognised the different environments, threats and opportunities but somehow managed to cope with the transition from one occupation to the other. The coast connects port cities of importance in trade, settlement and industrial sites.

The coastal environment is among the most fragile and dynamic environments on the planet making coastal archaeologists involvement into the issues of environmental change a necessity, as it affects the resources that they study. They either express concern about the change, or an interest in adapting to and managing the inevitable change in the coastal environment due to either human and topographical impacts.

No matter what the interest, many archaeological sites are lost each year. It is impractical to preserve and protect all coastal sites. But is it important to record all coastal sites, study as much as possible. An open-source of database of what has been lost and what types of sites once populated the landscape, will provide valuable information for current and future discoveries. Such a database is invaluable not for studying the past, but for also managing coastal sites and resources that are worth protecting in the future.

The coastal archaeological record is a tremendous storehouse of data on maritime culture. Such data has the ability to answer questions about past maritime people regarding their subsistence and showing possible solutions for any future challenges.

*[**Extra Activity:** Voluntary presentation on the wreck of the medieval ship MARY ROSE.]*

3.3 - Recreational Scuba Diving

The ability to breathe underwater, is the closest humans can get to the feeling astronauts get when they float in space. Scuba divers carry their own source of breathing gas, usually compressed air, either in open circuit scuba systems, where the exhaled gas is released in the environment, or in closed or semi-closed circuit breather scuba systems which allow recycling of exhaled gases. The duration of time spent underwater, is

subject to the depth of the dive. Maximum recreational dive depth varies from country to country. Major worldwide recreational dive certification agencies consider the depth of 40 meters as the limit for recreational diving.

Recreational scuba divers require necessary training and certification and varies from country to country. There are also some standard equipment that are a necessity based on the type of diving that you intend to perform. Usually divers dive in pairs (the buddy system) in order to provide assistance to each other in case of emergency.

Underwater communication between divers is possible if they are both equipped with a full-face mask and electronic communication equipment. Normally, it is possible to communicate with basic and emergency hand signals, light signals, and more complex messages may be written on waterproof slates.

The most common hazard of scuba diving is the Decompression sickness (DCS) or as widely known, the bends. This is the process where normally during ascend, dissolved gases coming out of solution into bubbles inside the body on depressurisation. The risk of DCS can be managed through proper decompression procedures or via the carriage of dive tables or dive computers to limit their exposure and to control their ascend speed. DCS is most commonly observed in the shoulders, elbows, knees and ankles. Joint pain ("the bends") cases include headache and visual disturbance as symptoms.

Scuba diving is widely used nowadays for leisure purposes including, underwater photography/videography, interest in the details of the environment, fish observance, underwater study of aqua life, research, underwater archaeology, exploration, cave diving, wreck diving, drift diving, night diving, training, and even stress management.

*[**Extra Activity:** Voluntary presentation about Jacque Cousteau and his contribution to scuba diving]*

Recreational Scuba Diving is increasingly popular in countries with clear visibility in water (clear sea) and abundance of aqua life (fish, turtles etc). Dive sites could be the sea, lakes, rivers. Many countries have used artificial reefs (sunken ships, tanks, vehicles) as a way to attract marine life and therefore increase interest in recreation scuba diving. Warm water diving is comfortable and convenient. The contribution of recreational scuba diving as a tourist product is not to be underestimated. It is an important sub-sector of the broader tourism sector and consists of businesses that offer day and live aboard services for scuba diving and dive certification courses. It is a major source of economic activity and regional employment with a steady upward trend. In many countries, this is still an unquantified activity and research is needed to appreciate the real input of recreational scuba diving into the economy.

Recreational scuba divers are generally well disposed towards marine science. There are scientific research and monitoring projects where scuba divers participate by sharing their geolocated photographic observations collected during their recreational dives for the open and free use of scientists. This open sharing of data could be an effective approach to marine and coastal conservation and a prime example of the citizen participation in developing related policies toward education, species management and community capacity building. In order to ensure reliable data collection, training by competent professionals could be offered free of charge.

*[**Extra Activities:** Voluntary presentation on the excavation of an ancient wreck by University (Archaeology Department), free diving training and free participation in recovering amphorae and ancient artifacts from the wreck]*

3.4 - Sea Gastronomy

Seafood includes fish (including cetaceans whales and dolphins and also seals) and shellfish (clams, oysters, mussels, octopus, squid etc), crustaceans (shrimps, crabs, lobster etc) and echinoderms (sea cucumbers, sea urchins). Edible plants such as seaweed and microalgae are widely eaten around the world and especially in Asia. Seafood is openly used in many countries to also include all fish originating from fresh water as well. Therefore, seafood is synonymous to all edible aquatic life and includes all edible organisms eaten by humans.

It is estimated that over recent decades the annual global consumption of seafood has doubled to 20kg due to its wide availability and beneficial nutritional value.

According to the UN, today's world population of about 7 billion people will rise to approximately 9 billion by 2030 and to 10 billion by 2050 which will provide added pressure in global demand for additional food.

Although, global capture fisheries increase at a rate of 6% per year and despite the unprecedented increase of aquaculture production which recently superseded wild-capture fisheries as the main source of seafood for human consumption, it is unlikely if that would be adequate for the anticipated increase in human population. Although almost all aquaculture production is consumed by humans, an estimated 30% of capture fisheries, was used for fishmeal and oil. Aquaculture production is therefore seen as a promising constituent to meeting human demands in food in the future.

Around 35% of all global capture fisheries and aquaculture production is distributed internationally which is higher than meat (10%), milk and dairy products (7%). This is due to international demand and the discrepancy between aquaculture production (mostly in Asia) and seafood demand (Europe and north America). The globalisation of the seafood market offers the possibility to find seafood from all over the world in

almost any developed country. Therefore it is imperative that international collaboration should be advocated to promote policies in order to ensure long-term sustainability of all seafood production.

In recent years gastronomy has become a major reason and a motive to carry out a tourist trip. The fulfillment of food expectations is highly important and gastronomic tourists are not just looking for quality food but also for stories, legends, and the origin of such food. Gastronomy is embedded in the culture of the country and is associated with the identity of the country and hence for a country which is considered a tourist destination, gastronomy cannot be ignored. Gastronomic tourists evaluate the attractiveness of food and the environment and the quality of service for its perceived value. Tourists should be included as partners in the process of designing the overall experience of exploring and discovering the gastronomy of a country. They all want to experience, cook, buy and taste local food and drinks and take an idea or two back home on return.

Sea Gastronomy prerequisites for deep respect of marine resources and their sustainability. It enriches not only the culture of a country or a region, but also adds a new dimension of gourmet seafood restaurants, famous sea-chefs, food programs and expeditions, festivals etc.

*[**Extra Activity:** Voluntary Presentation of a recipe (seafood) including general nutrition benefits as a niche dish in a coastal Seafood restaurant.]*

*[**Extra Activities:** Perception of different kinds of seafood and linkage to a country.*

Octopus, seaweed, shark, whale, dolphin, eel. Relate each of these species with a country. Organise a Seafood Festival in your country and decide what seafood to serve that represents the region or the country.]

3.5 - Sailing

Earth is covered by sea in two thirds. It produces 70% of the oxygen we breathe, it provides us with some of the biggest and most amazing creatures on earth, it offers us food, jobs, exciting life, entertainment and … sailing!

Sailing started as a means of fishing, transportation and exploring new worlds and continents. Over the last century, due to other means of propulsion, sailing (pure sailing due to the existence of wind) has been confined almost totally, to a pure pleasure activity as a sport and as a hobby. We live on the water because we share a passion for the sea

and we still have the desire to keep the sea as our playground as we first experienced it at the early stages of our lives.

Sailing is a sport/hobby which is equally popular with young and/or with retired people because it offers such a wide range of boats where you may practice, and you may sail in any particular manner which suits your wishes. Such is the beauty of sailing and that is why it attracts and appeals to many crowds. Currently sailing represents either recreation or sport. Recreational sailing is either racing or cruising, with the latter incorporating offshore and ocean-crossing trips and coastal or day sailing near the coast.

Anyone can access, anyone can join, and anyone can enjoy. This certainly characterises sailing and should be the driving attraction for newcomers to this eco-friendly sport. However there is a need to enhance eco friendly sailing with simple good seamanship and boat care.

*[**Extra Activity**: what can we do as sailors to be even more friendly to the environment? Use main engine as little as possible, maintenance of boat/hull, use environmentally friendly anti-fouling, recycling on board, discharge NOTHING to the sea etc.]*

Sailing is widely considered a sport for people who can afford expensive boats, marinas and lifestyle. However, sailing may only require extremely little expense to own a small dinghy, which is possible to offer you as much, if not more, excitement and fun as a big sailing cruiser. Under the banner of 'Blue Economy' many countries have initiated discussion to provide a platform for learning about the sport, sharing experience and working together to diversify the future image of sailing. Listen and learn from the leaders in the sailing community in order to bring diversity to the sport and enhance participation to the sport as much as possible.

Image from Pixabay

Sailing is a sport but can also be considered as a driver of innovation and economic growth. The overall sport sector accounts for more Gross Value Added, therefore larger contribution to the economy of Europe, than agriculture, forestry and fisheries combined. It is also a more resilient parameter of the economy during economic crisis, which makes it even more important both to the economy and to job seekers (www.sportyjob.com).

The amount of financial contribution of boating in the US is approximately 2% of the GDP, which amounts to around 380 billion USDollars with approximately 5 million jobs. The annual contribution of recreational boating in the United Kingdom is approximately 1.5 billion Euros per year with participation of almost 3 million people. The contribution of recreational boating is highly underestimated and the benefits extend beyond

financial to cover also social benefits via social cohesion, positive influences on numeracy and literacy in young people and reductions in antisocial behaviour. Although the contribution of sailing alone to above benefits cannot be isolated, sailing has tremendous potential to evolve into a major financial contributor due to its environmental credentials and advantages.

There is a need to promote sailing to all generations in order to bring new participants into the sport. Within the sport itself, there appears to be a reluctance for sailors to shift from dinghy to cruiser and this may be due to high cost of maintenance and yacht ownership. In the United Kingdom, participation in sailing is trending downwards, while in sailing countries, such as New Zealand, it remains as trendy and popular as ever. However, this current trend suggests there is an opportunity to find new ways to encourage casual sailors to sail more. Despite a more active 'third age' sailors indicate an upward trend in sailing activities, attracting the younger generation to the sport might rely on innovative ways. While traditional training may no longer attract the number of people in sailing as required, perhaps more accessible experiences with shorter formats may reverse the trend. Many sailing clubs have developed programmes of formal training based on race training models for young adults. This was a response to society requesting activities to enable interaction, quality time with friends, sharing experiences and which are accessible and easy to organise.

Potential sailors expect instant gratification and finding a boat and joining a club should be easily accessible. Future generations have less desire to own assets such as cars or boats, hence finding access to equipment or the opportunity to try sailing, is what they desire.

Sailing is a fantastic sport with so many different crafts, in different sizes and for different experiences. It is essential to understand the current and future needs of the people who are engaged in sailing, and encourage more to adopt a sailing for life approach.

3.6- Combination of sea activities

Blue Economy offers the possibility of combining different economic activities in order to offer new investment possibilities, ensure the viability of the activity for future generations and provide for an enlarged and enhanced experience of the sea by the wider public. These synergies may be advisable for the increased economic performance, but more importantly to facilitate a more efficient and environmentally sustainable management of maritime and sea activities.

d) Sea and Humanity

Suggested school activities to be developed in this dimension:

- Data research and project work presentations on the importance of the sea throughout history in partner countries (cultural, geographical, historical and national identity aspects) – reflecting the connection of those communities to the sea in past, present and future.
- Conduct student assemblies on the topics under discussion, with the possible presence of specialists in the area; Student Assembly: subject of debate, the importance of the Sea, possibly with the presence of field experts;
- Introduce Marine archeology to the students.
- Discuss the advantages and disadvantages of Tourism in coastal areas;
- Creating Sea Representatives;

According to the United Nations, "*The oceans are the very foundation of human life...*[6]" and so it is proved, if we approach it from a historical perspective.

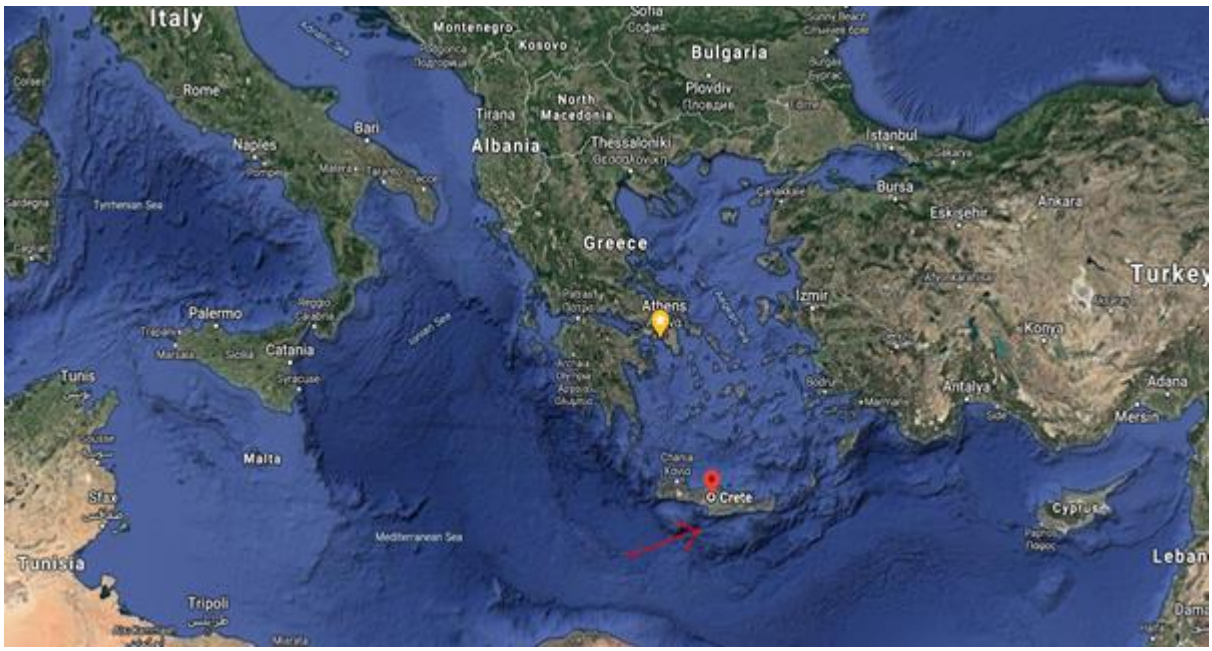
***Tip**: What you will be reading below could be project's topic for engaging students in Blue Economy. Let's launch!*

Minoan Civilisation

It becomes really interesting to detect the various ways that the sea has given unique opportunities to people in travelling and exploring, in exploiting sea resources, in being part of naval battles and building empires over the seas. The empire of the sea, "Thalassokratia" in Greek language, is a common thing for countries around the Mediterranean Sea. Back to the 3rd millennium B.C (Bronze Age), Minoans that lived in the island of Crete[7] (in the south of Greece, just before reaching Africa) have actually based their civilisation upon the sea; and they became the leaders of the Aegean Sea for quite some time. As Thucydides, the famous ancient historian described in his History, "*King Minos is traditionally the oldest person, who acquired a fleet and managed to become the owner of most of the Greek sea. He imposed his rule on the Cyclades and established the first colonies in most of them*." History A,4.

[6] https://www.un.org/depts/los/oceans_foundation.htm

[7] http://users.sch.gr/ipap/Ellinikos%20Politismos/AR/ar.ag/Siren-1.htm



The "Odyssey"

Another reference point could be the Greek Mythology, which is fully based on anthropomorphism[8]; Giving human characteristics to natural elements proves the divine substance inside them and the most representative example of this trend is that Earth's children are the Sky, the Sea and the Mountains. There are many other examples that reflect the power of these natural elements throughout the years and under their anthropomorphic dimension they are the key tools (and sometimes weapons) that the Greek gods used for or against humans.

In Homer's epic poems, and more specifically in the "*Odyssey*", we realise the importance of the sea in people's lives; The "*Odyssey*" is about the tale of Odysseus' homeward marine journey, after winning in the Trojan War. Historians believe that most probably the tale was conceived (but not yet written) and started to be orally disseminated during the second half of the 8th Century, BC.

Ulysses or Odusseus, the main character, has been wandering around the sea for ten years time, after winning in the Trojan War. His main goal was to travel back to his island kingdom, Ithaca. But his inappropriate behaviour against Cyclop Polyphemus made Poseidon, the king of the Seas, angry, so he has decided to torchure Odysseus by leaving him alone and helpless, struggling to survive and soon enough without his devoted companions. (Poseidon's grudge against Odysseus rhapsody 5, [9])

[8] *the showing or treating of animals, gods, and objects as if they are human in appearance, character, or behaviour*, **Cambridge Dictionary**

[9] After eighteen days at sea, Odysseus spots Scheria, the island of the Phaeacians, his next destination appointed by the gods. Just then, Poseidon, returning from a trip to the land of the Ethiopians, spots him and realizes what the other gods have done in his absence. ***Poseidon stirs up a storm***, which nearly drags Odysseus under the sea, but goddess Ino comes to his rescue.

The whole epic poem is set up in a marine background, full of vivid and lyrical descriptions, which highlight the sea' s impact on the greek people, who have been famous sailors and traders around the Mediterranean Sea.

Legends about Sea creatures in the ancient times

This image is from an ancient greek red figure pottery, in which Odysseus, tied on the mast of his ship, is listening to the popular song of the flying Sirens[10]; these female sea monsters used to seduce the travellers, captivate and eventually kill them. An aspect of this legendary story is captured here, in this vase.

The sea is a dynamic element that can both unite and destroy civilisations and kingdoms, that supports or sometimes hides tangible and intangible heritage and of course, it is the perfect place for the revival of myths and legends. Mermaids[11] are a typical example of the tendency and need that people have in believing in extraordinary creatures ; the sea has been and still is an undiscovered place, so it allows us to invent strange beings[12] and transfuse to them magical characteristics, in order to inspire fear and build a fairy tale of unprecedented value. In Greece the legend says that the mermaid is the sisterof Alexander the Great, who mad from the absence of her brother lives in the sea and submerges only to ask sailors if her brother is alive. In the case they say that he lives sheis happy and the sea calm. On the contrary, if they answer no she produces a big storm to drown them.

Moving from BC to AC era across the Meditteranean Sea

During the Roman empire, the Mediterranean Lake[13] became the place where trade was flourishing, while in the Byzantium period the Byzantine Empire established itself in the area as a maritime power. At all times, people were facing tremendous weather conditions while sailing, not only due to the bad sea but due as well to terrible storms

[10] https://www.awesomestories.com/asset/view/Odysseus-and-the-Sirens
[11] https://www.leisurepro.com/blog/ocean-news/mermaid-myths-from-around-the-world/
[12] https://marinebio.org/creatures/mysteries/
[13] https://www.enotes.com/homework-help/what-made-mediterranean-sea-become-important-368331

and winds. Piracy[14] was also a serious threat and pirates have managed to rule the Mediterranean Sea and spread fear and insecurity around the costal areassince prehistorical times till 19th century. This eventually created a daemonic atmosphere and caused many villages in the islands of the Aegean Sea to be located in the center of the island and being fortified. Still, navigating in the Mediterranean Sea was the faster and safest way of travelling or transporting goods from one country to another, especially after the official framework that was set during the 19th century, which was actually securing safety of ships and their crews. The role of the sea was redefined under the framework of the Industrial Revolution, when people were anxious to get as much as they could by dominating it. That is why they have invested in shipbuilding and improving methods of sailing and in the same time they have built strong commercial relationships; all these have managed to reinforce their maritime skills and seamanship.

Current outline - the 20th Century

In modern times, people have started to realise the wealth from the sea and as a result, they have over-exploited it. Which eventually brings us to nowadays; Sea environment is frafile, hence its sustainability is a priority. Unless we raise awareness about it to new generations, they won't be able to enjoy sea treasures for long.

14 http://www.imo.org/en/KnowledgeCentre/ReferencesAndArchives/HistoryofSafetyatSea/Documents/P.%20Boisson%20History%20of%20safet%20at%20sea%20extract.htm

Source: https://oceanservice.noaa.gov/facts/why-care-about-ocean.html

Maritime tangible and intangible cultural heritage[15]

People used to live near coastal areas back from the ancient times, a proof that their lives were in full interaction with the sea. Archaeological findings support this fact. At the same time, climate change and pollution have caused serious damage to coastal and maritime cultural heritage. Shipwrecks, monuments and buildings, as well as landscapes have been negatively affected not only by the time, but also by overpopulation, urbanisation or neglect, while certain marine professions, due to technological and/or social changes, have been abandoned for years, breaking the chain that harmonically connected the sea and the people. As mentioned before, Marine / Coastal archaeology is totally supporting this aspect by revealing sea treasures and giving people the opportunity to visit[16] them. Sometimes, tourism management could cause significant problems to tangible cultural heritage, e.g establishing a suffocating timetable for visiting an archaeological site, which might cause some damage to the marbles etc.

[15] https://www.interregeurope.eu/policylearning/news/7320/maritime-cultural-heritage/?no_cache=1&cHash=18c1c73dd00732e8427c47b6b3d8e5a9

[16] The first underwater museum in the island of Alonissos, Greece opened at the beginning of August 2020 https://greekcitytimes.com/2020/07/31/greeces-first-underwater-museum-in-alonissos-opens-august-1/

Sea and its effect on Literature and Arts

Moreover and throughout the years, the sea has inspired people to create unbelievable artistic representations[17], to write magnificent novels and poems[18], to compose songs and eventually establish a strong bond between the sea and art[19] throughout the centuries. Additionally, the sound of sea waves has been proved to be beneficial for people's mental balance, which is interesting to realise from a spiritual point of view[20] .

According to Wikipedia, Naval fiction[21] "…*focuses on the human relationship to the sea and sea voyages and highlights nautical culture in these environments*".

Please, find below an interesting link with some bonus facts about the Oceans and Humans and the way they are connected!

https://www.arcgis.com/apps/Cascade/index.html?appid=5806f70d14764407844c6b5344f2e24c

[17] https://www.boatinternational.com/luxury-yacht-life/interiors/the-new-wave-meet-the-contemporary-artists-inspired-by-the-sea--36123

[18] https://interestingliterature.com/2017/08/10-of-the-best-poems-about-the-sea/

[19] https://mymodernmet.com/ocean-art-world-oceans-day/

[20] https://www.youtube.com/watch?v=e_Bh-mvgC0U

[21] https://www.hartismag.gr/hartis-20/pyxides/fobamai-th-oalassa-panagiwths-kexagias-giwrgos-skampardwnhs-mairh-staoopoyloy-panos-tsiros?fbclid=IwAR2SIy4t8DS1vINiXXHMa8Mzh528vPoDsYLR8t5YFKOonEmBg_O3wG4x67Q#

National examples

GREECE

1. Is there a national or regional or local vision for integration of Blue Economy in your country/region's schools?

   Greece is the country having the 9th biggest length of coastline, and it is the biggest ship-owning nation (but only 9th flag state). It has around 6.000 smaller or bigger islands, of which 117 are inhabited. So there is a great need for developing the blue school concept and blue school activities.

2. Do you have any case in which Blue Concept is already presented in your country/region's schools?

   There is no specific example of coordinated blue school concept learning activities in our region. Yet, there are 2 Nautical Lyceums (upper secondary schools) in Piraeus, in which students study basic knowledge and skills for following a maritime profession. One of them participates in the Erasmus+ project "Onboard Additive Manufacturing for repair at sea", in the framework of which they learn how to use 3D printers to apply and adopt new know-how in the educational curriculum of the school..

3. Can you share an example in which Blue Economy is embedded in the school curriculum?

In most schools mainly in th lower high schools, there are extra-curricular activities having to do with the environment, the culture, the community etc., in which teachers experiment various educational methods. Participation in these extra-curricular activities, which take place after the end of the compulsory schooling hours, is voluntary. These extra-curricular activities could be a good basis for implementing and developing the blue school concept.
The Lascaridis Foundation organizes a series of lessons for school-students, among which:
"The big port, crossroad of evolutions in Greek history" for gymnasium students,
"Tracking realitiesand aspects of the city. The history clock rings in Piraeus".

4. Did students from your school area ever have the chance to meet with relevant stakeholders, e.g shipping companies, fisheries or were they ever engaged in local events, e.g. did they ever participate in local events about Blue Economy?

   Not in a coordinated way.

ITALY

1. Is there a national or regional or local vision for integration of Blue Economy in your country/region's schools?

In Italy there are almost 200 thousand companies operating in the sea economy (Blue Economy); therefore there is a national vision for the integration of Blue Economy in the Italian schools. Besides the nautical Institutes, (Technical High Schools), which train students specifically to be professionals of the sea, Blue Economy is one of the topic present in the subject called "Civic Education" , which is compulsory in every kind of school at all grades. This subject aims to develop the knowledge and the understanding of the social, economic, legal, civic structures of society and how to use natural resources wisely in order to protect our environment for the benefit of future generations

2. Do you have any case in which Blue Concept is already presented in your country/region's schools?

We have several Projects related to Blue Economy in schools, one of this is the Project "The Nauticinblu " (Nautical Technicians in blue) a training course in environmental education of the Marevivo (The living sea) association that involves about a thousand students from nautical institutes in many Italian regions. Marevivo's objective is to contribute to make future professionals of the sea acquire skills that go beyond the school curricular path, to reach the analysis and knowledge of the many issues, but also of the numerous emergencies, on environmental protection and the sustainability of activities that can be developed at sea. In this Project the students will carry out training activities both in the classroom and outdoors, to learn about new job opportunities offered by the blue economy, but also the collective and individual interventions that can and must be implemented to protect a marine ecosystem, which has been subjected to over-exploitation for years. The entire course will allow students who have chosen the sea in their future work to become future professionals in the sector, but also more attentive and responsible workers

3. Can you share an example in which Blue Economy is embedded in the school curriculum?

Education for sustainable development is today a strategic goal for the present and the future of our country. The environmental challenge, linked to the conservation of our planet's resources, represents a challenge that cannot be avoided for future generations. We are in an era that imposes on the whole world, but in particular on Italy choices radically different from those made in the past: far from the traditional production model, directed towards a new economy model that respects the environment, oriented towards a society that does not produce waste but knows how to create wealth and well-being with the reuse and regeneration of resources. In order for this to happen, a profound change of mentality is necessary, involving institutions, companies and individuals. And this new national awareness started some years ago with schools and students of all ages.The educational path developed through different learning units, depending on the school order and the year of the course, aims to lead pupils and students to acquire full awareness of their role in the environment. It

is considered essential that, from an early age, pupils gradually learn to know and deal with the main problems associated with the use of the territory and are aware of their active role in safeguarding the natural environment for future generations. Their participation in this educational project will increase their knowledge, skills and competences, with the ultimate aim of creating aware and responsible citizens towards the protection of the natural environment and its resources.From what is written, the following general purposes are identified:

- *Promoting ecological awareness. We all are co-responsible for the care of our planet.*
- *Enhancing the ability to observe the environment around us.*
- *Developing a sense of respect and protection of the environment also understood as a lived space.*
  Understanding the importance of transforming the knowledge acquired into eco-friendly behaviors.
- *Formulating hypotheses for solutions to environmental problems and assume responsible individual attitudes and behaviors.*

Studying Blue Economy cases is fundamental in our schools. Actually it is one of the main issues which mostly Civic Education teachers tackle with their pupils/students every year and in every school order.

4. Did students from your school area ever have the chance to meet with relevant stakeholders, e.g shipping companies, fisheries or were they ever engaged in local events, e.g. did they ever participate in local events about Blue Economy?

Yes, they have.

4. Educational Methodology

Vision and strategy

The mission of this project is to direct students towards reading, interpreting and getting to know better the marine environment, through images, texts, songs, outings on the territory, interviews, recipes, all related to the culture of the sea. The marine environment could be explored from different points of view:

- Scientific: observation of flora and fauna; classification of the material collected during educational outings

- Historical: observation of the characteristics of the environment and its transformations over time

- Ecological: students will develop a sense of respect for the marine environment and adopt such behaviors that can concretely guarantee its protection

- Social: knowledge of the traditions linked to the civilization of the sea

The sea environment and sea-related professional, leasure and way of living activities are a reality that a student has to be aware of, reflect upon and think about of ways of improving or as a basis to develop innovative ideas upon. This is why, the Blue school activities are not offered as a subject for traditional teaching, but as an opportunity to deploy a multitude of activities, connected to a variety of school lessons and disciplines. Most of all, educational methodologies, used by Blue schools, aim at students developing in parallel many skills such as creativity, team working, problem solving, decision making etc.

Objectives

-Raising the awareness of school children and teachers to issues related to sea water and sea economy and on how these are linked with preserving the environment.

- Promoting oceanary education, environmental education and encouraging blue economy activities.

- Promoting environmental education and raising awareness among children and the community regarding the sea, the coastal environment and economy.

- Promoting contribution to the sea literacy and the sustainable management of the sea in education systems.

-Students becoming agents for change and sea sustainability.

- Seeking for inspiration and support on how to address sea topics that are relevant to curricula, schools and community.

- Helping students to become sea advocates in their own area /region as well as agents of transition supporting changes in perception, values, attitudes and behaviour towards more sustainable practices, management of the sea and blue economy opportunities.

- Assisting schools to address marine topics in class that are relevant to the school, the local community and the region and find inspiration to develop and implement Blue activities.

Pedagogical methods[22] applied in Blue schools

At this point, it is important to decide which method suits you best.

- Will you use a student-centered approach?

- Will it be based in cooperative learning, e.g team working, group projects / assignments?

- Will you follow a high-tech (using digital tools, flipped classrooms or game-based learning etc) or low-tech (traditional tools, kinesthetic learning) approach?

Disciplinary integration work/ curricular articulation domains (DAC) - According to a Portuguese Decree-Law No. 54/2018, "*A DAC, in an intersection of learning from different disciplines, explore pedagogical and didactic paths, in which practical and/or experimental work and the development of research capacities are privileged, and analysis, based on, namely:*

a) The themes or problems addressed from a disciplinary perspective, in an interdisciplinary approach;

b) The concepts, facts, relationships, procedures, capacities and competences, in their transversal and disciplinary specificity;

c) The textual genres associated with the production and transmission of information and knowledge, present in all disciplines."

In this way, a DAC can start from a content transversal to several disciplines, from a problem, an issue or a challenge proposed by teachers or students, in which several disciplines articulate strategies and knowledge, developing learning in context and in a more practical way. Learning becomes more motivating and effective and the work is done in a collaborative way, developing not only the essential learning expected, but also the skills registered in the Students' Profile. For its achievement, active methodologies are preferably used, such as:

Flipped classroom[23]: *It is a pedagogical approach in which the traditional elements of the lesson taught by the teacher are reversed* - the student studies at home through

[22] https://www.educationcorner.com/teaching-methods-strategies.html

[23] https://youtu.be/iQWvc6qhTds

videos, articles or other resources on the subject of study and later works about it in the classroom. Thus, the student has a more active role and becomes more responsible for his learning path. The teacher guides the work and learning, giving constant feedback.

Experimental Learning : Laboratory exercises are a procedure involving marine experiments with the sea materials or facts derived from investigations or experimentation.

Real-Life Learning : Exposing students to real-life working environment by organising field trips to beaches and sea and on-site visits or inviting speaker from the sea industry to give presentations in class. It is an authentic learning that engages all the senses allowing students to create meaningful , useful, shared outcome. They are real life tasks, or simulated tasks, that provide the learner with opportunities to connect directly with the real world.

Work Experience: the student works as a trainee in a shipping company or other practice-based work environment.

Student exchange: students are studying with another educational institution for a limited period of time for marine activities. Student's exchange will result to some real and positive learning experiences.

Collaborative Learning[24] : *Collaborative learning is the educational approach of using groups to enhance learning through working together*[25]. Groups of 3-6 learners working together to solve problems, complete tasks, or learn new concepts. Students make group studies on marine lessons and learn from each other. Through defending their positions, reframing ideas, listening to other viewpoints and articulating their points, learners will gain a more complete understanding as a group than they could as individuals. Learners benefit from hearing diverse viewpoints from their peers. Working in a group improves the attention, involvement and acquisition of knowledge, making learning more effective and meaningful. In order to achieve the defined goals, learners need to interact, coordinate ideas and strategies, respect each other as individual entities and help each other to improve, leading each one to do their best - "*Stronger together - alone I go faster, together we go further*".

Game based Learning[26]: It consists of the use of educational games on the addressed

[24] https://youtu.be/rWEwv_qobpU

[25] https://www.valamis.com/hub/collaborative-learning

[26] https://youtu.be/4qlYGX0H6Ec

topics, as a way to motivate students and increase their commitment towards learning. Building and playing games encourages healthy competitions and leads to the development of skills in a more ludic and pleasant way, meeting their interests. Through games students also collaborate, communicate, interact and work in teams.

Project Based Learning[27]: *Project-based learning is an instructional approach designed to give students the opportunity to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world*[28]. It consists of the development of projects where students explore real-life problems and challenges on the subject of study, allowing them to acquire more effective knowledge on that topic and to develop soft/key skills.

Problem-based learning [29]: It is a process in which you start by asking or thinking about a problem related to the addressed topic, with the aim of finding answers and solutions to it, in a creative, critical and innovative way - ideas generate ideas. To get answers, students bring together different areas/knowledge, use different methodologies and resources, test the applicability and feasibility of their ideas, make decisions and predict or evaluate their impact, developing processes leading to the construction of products and knowledge. Critical thinking, creative skills and problem solving abilities are improved.

Web based learning: *Web-based learning refers to the type of learning that uses the Internet as an instructional delivery tool to carry out various learning activities*[30]. A type of instructional strategy that is based on resources available on the web. Learners learn individually or in groups about Marine life and Blue economy by searching on the web.

Learning by searching: *A learning environment that provides searching and analysis facilities for supporting* blue *schools trend analysis activities*. *Based on the "Learning by Searching" theory, a learning environment is developed, which includes a search engine to assist students in recognizing the progression of trends and keyword transitions for specific domains.* [31]

Effective class discussion: Discussion is important to learning in all disciplines because it helps students process information rather than simply receive it. *Leading a discussion*

[27] https://youtu.be/LMCZvGesRz8
[28] https://www.schoology.com/blog/project-based-learning-pbl-benefits-examples-and-resources

[29] https://youtu.be/RGoJIQYGpYk
[30] https://www.igi-global.com/dictionary/web-based-learning/32418

[31] https://kyushu-u.pure.elsevier.com/en/publications/learning-by-searching-a-learning-environment-that-provides-search

requires skills different from lecturing. *The goal of a discussion is to get students to practice thinking about the course material*[32]. Whole-class discussions can encourage students to learn from one another and to articulate course content in their own words. While generally not conducive to covering large amounts of content, *the interactive dynamic of discussion can help students learn and motivate them to complete homework and to prepare for class*[33]. Students will discuss about blue school and blue economy and in this way they will exchange the ideas on blue school concept.

Creative thinking:

A - Inventiveness : Teachers approach inventive thinking as a practice, creating opportunities for students' imaginations to run wild and then helping them to focus, harness, and apply critical thinking to their big ideas.

B - Openness : Teachers assess students' ability to get to right answers; but most importantly, they provide opportunities for experiences, conversations, and ideas to grow their open-minded dispositions.

C - Individuality : child's individuality is celebrated through the strategies they think up, the expressions and impressions they create, and the next steps we plan for their class. With expert teacher guidance, child follows their curiosity, participates in planning the next steps in their studies, and engages in assessments of their work.

Ways of Thinking :

A – Asking questions : What am I curious about marine life? What do I need to know about blue economy ?

B - Promoting Reflection : What did I learn about myself on Blue schools and Blue economy ? How can I deepen my work or thinking based on my own reflection?

C - Taking perspective : How can I approach blue school idea by using different lens ? How is another viewpoint similar or different than my own?

Examples of type of activities in the framework of the above educational methodologies

- Brainstorming
- Problem posing & solving
- Lectures and moments of study
- Educational trips to explore the local coastal ecosystem
- Interviews

[32] https://citl.indiana.edu/teaching-resources/teaching-strategies/discussions/index.html

[33] https://tltc.umd.edu/classroom-discussions

- Data collection
- Laboratory activities
- Cooperative learning
- Group work[34]

Pedagogical resources

Teaching with Data, Simulations and Models : Teachers have the opportunity to create innovative learning experiences by bringing real-world data sets and models and simulations of marine processes into the classroom.

Teaching With Models : This resource covers the technical and pedagogical considerations for how to incorporate modeling activities into courses, with examples of models for use in the classroom. Students import ocean bathymetry data from text files, they then use Excel to graph these observations along with model prediction to assess the model's ability to simulated the observed topographic features .

Teaching with Digital Materials : youtube, google search, powerpoint, prezi, google classroom.

Teaching with Three-Dimensional Materials : puppets, models, toys, play equipment, museum visit.

Teaching with Auditory tools : Radio, Tape, Cd…

Teaching with visual tools : Book, picture, map, graphic ..

- What are the tools/resources that are going to be used, in order for teachers to support and disseminate the Blue Concept to students?

- Articles from economic, scientific journals, magazines
- Documentaries
- Videos
- Educational outings
- Interviews
- Information on technological equipment

[34] https://www.realinfluencers.es/en/2019/05/09/8-21st-century-methodologies/

Examples of Platforms and digital resources

Google Apps: Slides | Docs | Drawings | Maps | Earth
E-Portfolios: Padlet | Sway | Wakelet |
Video makers/editors: Lumen5 | Biteable | Powtoon | Plotagon | Edpuzzle *(interactive video lessons)* | Shotcut | Animaker |
E-books: Book Creator | Calameo |
Creative writing: Languageisavirus | Word Art |
Writing collaboratively: Draftin |
Mind maps: Popplet | Mindup | Mindmeister | Coggle |
3D/Augmented reality: Minecraft education | Sketchup | Artsteps | Scratch | Quiver |
Presentations: Genial.ly | Emaze | Thinglink |
Games: Kahoot | Quizziz | Learning Apps | Socrative | Quizalize | Triventy |
Polls/Audience interaction/Vote: Mentimeter | Slido | Tricider |
Cartoons: Pixton |
Avatars: Avatar maker | Voki | Bitmoji |
Stories: Story map | Story Bird |
Maps: Tour builder | Story map |
Groups: Random team generator |
Other activities: QR-Code generator | Wheel decide | Canva.com | Timeline |
science apps: iNaturalist, GLOBE observer
Maritime Knowledge: the marine education app | Sea seek | Sea captain |

Students assessment

Products made by students [literary, scientific, iconographic materials, photographs, technological products (videos) recovery of traditions, e.g. through recipes based on seafood, dances etc.]

Considering individual differences in constructivist and student-centered education is extremely important. This situation must be taken into account in determining the level of gains and achievement of goals. Therefore, in order to measure knowledge, skills and attitudes effectively in the programme structure and evaluate by making the right decisions, multiple evaluation activities should be included.

In the measuring procedure of Cognitive skill (knowledge), measuring tools such as correct/ false, multiple choice, gap filling, matching, long and short answer tests should be preferred. Affective skills (interests, attitudes, and values) are learning outputs that cannot be directly observed. So, attitudes must be determined according to criteria of desired behaviours.

Psychomotor skills require mental and muscle coordination in education. For this reason, students need to transform the knowledge they obtain into practice. In this way students are expected to become skillful people.

It is important determining the students' level of having achieved the intended learning outcomes of each module. Teachers need to design first the experiment, project, practice or application and incorporate in it the relevant method of measurement of the level of acquisition of the respective learning output. In this way measurement may be achieved through examining e.g. the performance, the studies, readiness, observing changes in attitude, scoring criteria etc. School supplies are necessary to carry out the activity and assessing its learning outcomes should also be considered.

In addition, when preparing measurement tools, the attitudes and behaviours following the specific skill should taken into account too. A holistic approach should be established to assess cognitive, affective and psychomotor characteristics as a whole.

In order to make Performance based evaluation, checklist, rating scale, rubric should be used to evaluate and score the development of the students.

As a result, in the assessment and evaluation process of the programmes developed based on the outcomes, teachers should also be taking the above mentioned points into consideration and additionally the ones below:

- The level of individuals to achieve the intended learning outcomes at the end of the modules

- The achievements at the end of the course

- The professional training in business sector and individual gains should be measured and measurement results should be evaluated in accordance with the criteria determined for the specific area.

5. Developing a Lesson Plan

This part was developed based on the following useful resources[35]:

Developing a *Lesson Plan* is one of the core activities of this Teacher's Guide. There are specific steps according to which a lesson plan can transform the teaching material into an interesting experience.

1. *Setting goals*: In our case "Blue Economy" is the main one and the initial objective is to integrate the term to a daily course, such as history, maths, sciences
2. *Setting deadlines*: A clear task is based on clear dates; Is it a course that needs many days to be concluded or it can be finished on a daily basis?
3. *Finding resources*: Will the teacher provide online ones or give handouts? Will the students have searched for something from the previous day?
4. *Engaging students:* An inspiring introduction can intrigue students' attention and ensure their active participation during class.
5. *Providing clear and concrete instructions*: The teacher should explain how and why a lesson will be implemented in a specific way. The best way to achieve that is by thoroughly presenting every aspect and clarify any doubts that students might have.
6. *Closing the learning session by integrating Gamification*: Motivate students to participate in an online quiz (e.g Kahoot!) or a debate (e.g Mentimeter), wrap up your lesson and run students' assessment at the same time.
7. *Giving homework:* The teacher needs to clarify to students the time and the way they will use to do their homework.

Example of managing a school project: Plastic wastes : project centred on waste collection for an educational exhibition (animated)

Setting goals: To get aware of how human activities may endanger marine life and activities as tourism as well. How to turn a threat to opportunity.

Setting deadlines: The Project should be scheduled in 3 phases of 6 hours each:

1. Collection of waste on a beach with an environmental structure or in a port from professional fishermen.
2. Analysis of selected wastes: chemical components (physics and chemistry courses), area of production of inputs, raw materials and objects, marine currents (geography/geology), economic weight and environmental issues (economy and biology, etc.), and the impact on the environment.

[35] http://northernc.on.ca/leid/docs/developinglessonplans.pdf
https://www.teachervision.com/lesson-methodologies
https://cor.europa.eu/en/engage/studies/Documents/order%206203_Blue%20Economy_form_WEB.pdf
https://www.reesoneducation.com/blog/2020/01/10-steps-to-developing-an-engaging-lesson-plan

Analysis of the potential solutions for marine plastic wastes

- Exhibition on the journey of a plastic waste from its raw material, its transformation, its use and its abandonment in the sea. Explanation of the stages with the consequences on the environment with possible solutions (recycling), e.g. Repurposing/reusing of the fishing nets.

Finding resources:

- The collection of waste on a beach (litter bags, transportation to the beach)
- The analysis of selected wastes (chemical and physical laboratory, finding videos on the youtube, projector)
- The potential solutions for recycling (black- or whiteboard for brainstorming, room for exhibition)

Engaging students:

- The collection of waste on a beach. Students will collect plastic litter from the beach collaboratively. They will be divided in small groups of 5-8 people each. They will have to name and manage their group and compete between groups, *which group will collect the most plastic garbage*. The winner will get a prize discussed beforehand.
- The analysis of selected wastes. Students will write down the results of their measurements, discuss their findings and reflect on videos they will see.
- The potential solutions for recycling. There will be brainstorming, discussion of the proposed solutions and the results each one of them will imply to different stakeholders, thus developing their creativity, innovativeness, problem solution and overall estimation of impact skills. They will also discuss on how to engage the different stakeholders in the implementation of the solution they will opt for. Students will prepare their exhibition and promote it to stakeholders to visit it.

Here is a practical example from Catania, Italy:

Setting goals: Blue Economy is one of the topic present in the subject called "Civic Education", which is compulsory in every kind of school at all grades the goal of which, in the Italian school system, is to aim to develop the knowledge and the understanding of the social, economic, legal, civic structures of society. As far as Blue Economy is concerned, Civic Education promotes the use of sea resources wisely in order to protect our marine environment for the benefit of future generations. Environmental education and sustainable development is a topic also treated in all the disciplines that make up the Italian secondary school curriculum.

Setting deadlines: The course on Blue Economy lasted six months and the end was scheduled for the 30th of April 2020. It has been divided into teaching units. Each unit was made up of 6/8 one-hour teaching sessions.

Finding resources: Teachers provided videos and prepared handouts, whereas students were requested to watch or read them at home, so they come to class with questions, curiosities and a first smattering of the subject. Later on teachers talked with their students, resumed and stimulated the discussion, organised collaborative activities to deepen and explain what they have learned at home.

Engaging students: Teachers introduced the topic, which is connected to the Blue Economy, starting from the personal experience of their students, by asking questions, like:

- Have you heard of the Blue Economy?
- On what occasion?
- Are you or your relatives / friends engaged in the Blue Economy?
- In your opinion, what does the term Blue Economy refer to?

Providing clear and concrete instructions: Teachers set clear goals for each lesson and provided their students with clear instructions.

- ✓ The lesson begun with a summary of what has been done in the previous lessons and with a quick overview of the new goals.
- ✓ In classes where homework was given, teachers took 5-10 minutes to check what students have learned through homework.
- ✓ The contents of the new lesson were presented in a graduated way, so that students had time to practice or reflect after each step. Teachers helped them with clear indications and paid particular attention to those with learning difficulties.
- ✓ The lesson ended with a summary of the objectives pursued and a review of what has been learned.

Closing the learning session: Each learning unit ended with a debate among the students. This learning methodology allowed the students to acquire curricular and transversal competences (life skills). Moreover, it promoted cooperative learning and peer education, not only between students, but also between teachers and students. Teachers evaluated the interventions, judging the argumentative capacity, the strategy in the construction of the speech, the clarity and persuasiveness. Finally, they have decided the winning team and the best speaker of the debate.

Giving homework: An important part of the assessment work was correcting the homework which had been regularly assigned. Teachers made sure that homework was integrated with class work, took into account individual needs and that it was regularly checked and corrected in a "constructive" spirit.

Tip: *In a flipped classroom, students could carry out research at home before engaging in concepts in the classroom, with the guidance of a mentor. When going back to school they could watch online lectures, for example a video about "Environmental problems of the Mediterranean sea", collaborate in online discussions through Google Meet or Zoom and brainstorm about possible solutions.*

6. Application of Blue Economy in schools

Find below two examples of application of blue economy in schools. You could use them according to your class interests or in case you may already have any familiarisation with each subject.

The exploitation of culture and tourism in the prospect of Blue Economy

1. Culture and Gastronomy in Corsica
2. Sailing in the Mediterranean Sea

1. Culture and gastronomy in Corse

Culture and gastronomy have an important place in Corsica. They are based on the rural, pastoral and marine traditions.

Fishing occupies an important place in many ports of Corsica. The sale is mainly done directly in the stalls of the ports.

The fishing resources are very rich in variety of species: lobsters, sea urchins, sea bream, capon, grouper, oblade...

Many culinary recipes exist, often owned by fishing families. Many of them are lost and forgotten. Consumption patterns are changing and offers are concentrating on more popular species to the detriment of those that were once consumed.

The consequences are detrimental to the management of the fishery resource because fishing efforts are concentrated on the most noble species.

Archie Forrest, "*Fishing boat*", Corse, oil in canvas

Source: http://www.artnet.com/artists/archie-forrest/fishing-boat-corse-W2dF1pqQA7H87_8i__xiww2

School activities could be proposed in order to know the local gastronomy based on sea products.

- What are the local culinary traditions of the sea and ports?
- How are the sea products fished? By whom are they fished? How are they marketed?
- What is the difference between artisanal and industrial fishing and sea farming? What are the consequences in terms of greenhouse gases?

The targeted skills would be the following:

- Knowledge of the local port history
- Realising the importance of the fish varieties from the halieutic resource
- Linking the economic sector with professional fishing
- Discovering the streams of supply of fishery products
- Distinguishing the professional fishing and marine farming sectors

The disciplines concerned could be: Geography, History, Biology, Science, Economics, etc.

2. Sailing in the Mediterranean Sea

a. Introduction to sailing economics

Sailing in the Mediterranean Sea has a history of thousands of years. Ancient Greeks travelled across sea expanding commerce and trading all over the Mediterranean areas. From then till today the evolution and the technology in yachting elevates sailing in one big industry combining commerce, tourism and pleasure.

This Photo by Unknown Author is licensed under CC BY-NC-ND

Nowadays, sailing brings with it a false perception of wealth. There are even studies that indicate sailing as a hobby in your resume, which can increase your chances of getting hired at an elite law, finance, or technological company. However, it can also have an economic impact on national scale. This impact is most evident in various sailing races events, especially international competitions. Hosting such events drives economic growth and it is a great way to show off your city or country.

Yachting as a tourism product has an emerging pathway and it's a very promising industry in coastal regions, particularly in the Mediterranean countries. Its increasing success has resulted in a significant boom of other relevant business segments. Yachting tourism, as a leisure tourism, has exhibited a positive economic impact on coastal areas, and provides a substantial contribution to the local economy, especially to that of the islands.

Coastal countries can benefit a lot if they enable yachting/sailing tourism to acquire a dominant position in this emerging industry. They can do that by promoting their authentic local attractions, natural coastal resources, culture, traditional food etc.

Meanwhile, the intense yachting competition with other countries (especially in the Mediterranean Sea) presents a big challenge for the sustainability of the yachting/sailing tourism industry.

This Photo by Unknown Author is licensed under CC BY-NC

Useful links for *sailing economics*

- https://www.rya.org.uk/knowledge-advice/planning-environment/Pages/economic-contribution-of-the-recreational-boater.aspx
- https://pittbusinessreview.com/a-liquid-asset-the-economics-of-sailing/
- https://www.researchgate.net/publication/305488097_The_Sustainability_of_Yachting_Tourism_A_Case_Study_on_Greece

b. Sailing Holidays

Sailing a yacht around the Mediterranean Sea and its islands, is a dream-holidays or lifelong aspiration for many sailors and not only. It appears as a glamorous and exciting trip. Combining with a good weather the sun-soaked days and history of the islands promote a sophisticated holiday. And it is true; it can be all of those things. Nevertheless, a long-term cruising around the Mediterranean Sea is like long term cruising anywhere - there are ups and downs, excitement for good and bad reasons - and generally as much fun as you want to make it.

Sailing is always an exciting experience. On other hand, sailing holidays is an amazing lifetime experience. This is the reason why the yacht chartering industry has a sky-rise increase in the latest years, especially in Mediterranean Sea.

The sailing holidays has many advantages. Some of them are:

- **Privacy**. Having the chance to sail around with your own or charter yacht provides you the ultimate privacy – no having to share your mealtimes with other people and you get the best sea spots around. The boat can moor to a town for more social action or you can moor in a nice quite beach for a peaceful overnight relax with your family.

- **Flexibility.** Being able to cruise around and explore areas at your own time, eat in different local cities or villages without any stress, is astonishing. One minute you could be diving off the boat and snorkeling in bays, and then having lunch at a local taverna.
- **Hundreds of Destinations.** There are so many destinations to choose from in a short distance sailing and for more fanatic long distance sailing trips. From Greece to Italy and Croatia, the Mediterranean is filled with marvelous destinations for sailing trips.
- **Sailing experience is not a requirement**. Having sailing competence and a skipper certificate is for sure an advantage and gives you more privacy and flexibility. However**,** this is not a requirement because you can have your own skipper who will be happy to let the kids or you have a go at steering the boat, or letting you just lie back, relax and take in all the many magnificent views you'll be seeing.
- **Learn new skills and responsibilities.** Because a sailing holiday is so different from the normal holidays in a hotels or self-catering, kids and adults will be able to learn new skills onboard, with a sense of responsibility.
- **Not as expensive as you think…** The idea of a private yacht charter with a skipper for a week of family holiday, may cause you to believe that is a no-go but, is not as expensive as you think. The cost for one week with a skipper is around the same as a week in a four-star hotel for a family of four and if the kids are younger than 12 years old. And on top of that, you are getting your own private sailing villa which will take you to some destinations that you wouldn't be able to go to on land.

Useful links and references for *Sailing Holidays*

- https://www.sail-worldcruising.com/news/227116/Sailing-a-yacht-around-the-Mediterranean-Sea

- https://pittbusinessreview.com/a-liquid-asset-the-economics-of-sailing/
- https://www.researchgate.net/publication/305488097_The_Sustainability_of_Yachting_Tourism_A_Case_Study_on_Greece
- https://www.sail-worldcruising.com/news/227116/Sailing-a-yacht-around-the-Mediterranean-Sea
- https://www.seamaster.co.uk/223/yacht-charter-articles/general/8-reasons-to-choose-a-family-sailing-holiday-my-travel-monkey-for-seamaster-yachting

***Tip - Alternative suggestion**: Name a research work topic for teamwork. Work with the map, whatman paper, smartphones with installed apps, camera. For example, the research work "Collecting plastic rubbish on the sea coast" (how much rubbish gathered within an hour, what kind of rubbish, how can we recycle plastic, what is a zero waste) + cluster, collage or concept map from each team and presentation of each teamwork.*

7. Indicative Lesson Plans

In this part you will find some ideas to support you in developing Blue Economy lesson plans in your class. The concept is to give you guidelines in several disciplines or even better to help you create interdisciplinary courses and bring a more holistic awareness to your students in realising what a Blue School really is.

BLUE SCHOOLS

LESSON PLAN

Topic: Marine Water Cycle.		Subtopic: An example with a marine aquarium.	
Contents: **- Introduce Scratch** **- Marine water cycle** **- Create your aquarium computer simulation with scratch** **- Create your aquarium** **- Conclusions**	**Goals:** • Understand that efficient procedures/algorithms can be used to solve problems and to plan for specific outcomes. • Design and write programs that accomplish specific goals. • Solve problems by decomposing them into smaller parts. • Use sequence, selection and repetition in programs. • Use logical reasoning to explain how a simple algorithm works and to detect and correct errors in algorithms and programs. them and how life on earth is dependent upon their stability. • Explain how the water cycle recycles the earth's water supply. • Form a hypothesis on how/why the water cycle works.	**Skills** (a) Define basic programming concepts: variable, data type, procedure, parameter, conditional, iteration, flowchart, and pseudocode. (b) Write programs with sequences, conditionals, and iteration. (c) Know the water cycle flow	**Subject(s): Marine Water Cycle** This is the lesson in which information about knowing the marine water cycle.
Target audience: 8th Grade (Middle School)	**Typology: Project Methodology**		**Duration/Schedule:** 1 weeks
Material: • Scratch (free software from scratch.mit.edu version 1.3 or higher). It will run on all types of machines. It is also helpful to have headphones to cut down on the noise. You can ask the students to bring in their own headphones. There should be enough of the following for students to work in groups of three. In order to create the aquarium: soil, sand, modeling clay, water, large, clear plastic container, plastic wrap, plastic trees, animals, boat, etc, tape or large elastic band, bag of ice, heat lamp.			
			Strategies, rules and/or procedures
Procedure for the water cycle tests: Arrange the soil, sand and modeling clay in the container to make mountains, plateaus, hills, etc., and a lake basin. It's best if these are layered and students can see the layers in the clear plastic container. Leave room on one side of the container for water. Place the water in the water basin. Cover the container tightly with plastic wrap and secure it by means of tape or the band. Have each group write a hypothesis of what they expect will happen. Depending on when this lesson is done, put the aquariums where there is a lot of sun. After 1-3 days, the students should start seeing some precipitation. If this lesson is done in the winter or there is not enough sunlight coming into the room the process can be sped up by placing a bag of ice on one end of the covered container, while a heat lamp is focused on the other. Watch for condensation on the plastic "sky" of the container. When enough moisture collects, it will fall onto the landforms as precipitation.			Show students the water cycle showing the students how the cycle works. Then in the teacher's aquarium, place extra houses, trees, and people on the top of the hills and on the sides of the hills. Ask the students, "What do you think happens as we build houses and move more people onto the top of the hill and the sides of the hill?" Place a parking lot at the bottom of the hill with cars. Discuss with the students how this effects our environment as well.
Assessment: Measuring and evaluating will be done by using measurement tools at the end of the module and lesson in accordance with the regulation for passing the course			
Comments: Master trainers, technicians and professional staff with sector experience in the field of Computer Science and Maritime can be used in the implementation of the program when necessary.			

Dimension: 1. The sea belongs to us 2. Dynamic sea 3. Discover and explore the sea + ++4. Sea and humanity

BLUE SCHOOLS

LESSON PLAN

Topic: Marine and Aquaculture Technology		Subtopic: Marine and Aquaculture	
Contents: **- Choosing a career goal** **- Marine** **- Description and duties of seafarers** **- Hierarchy on board** **- Seafarer qualifications** **- Seafarer-employer relationship** **- Measuring distance on the map** **- Caring for iron material** **- Measuring the coordinate location of a place**	**Goals:** • You will be able to choose the goal of the profession. • You will be able to apply to become a seafarer. • You will be able to make an employment contract. • You will be able to conform to the ship layout. • You will be able to leave the ship. • In this course, it is aimed to introduce the student to the professions and to gain the initial competencies of these professions. • At the end of this module, if a suitable environment is provided, you can include someone among seafarers suitable for you as a professional target. • you will be able to choose, become a seafarer, get a job and work on a ship.	**Skills** A - Getting to know seamanship with the Ship Man module B - Determining the route with the Basic Navigation module C - Using a rowing boat by performing basic shipping operations with the Basic Shipping module D- Performing material maintenance with the Material Care module E- Making Basic Electrical Connections with the Fundamentals of Electricity module F- Making physical oceanography measurements with the Physical Oceanography module	**Subject(s): Marine and Aquaculture Technology** This is the lesson in which information about knowing the maritime professions is given.
Target audience: 8th Grade (Middle School)	**Typology: Project Methodology**	**Duration/Schedule:** 2 weeks	
Material: Training ship or simulation-enabled laboratory, classroom, sailing workshop, Aquaculture laboratory, fishing vessel, business, library (Flow meter, Anatomy tubs, Anatomy scissors, Arabian soap, Primer paint, Circular on hunting prohibitions, Angle grinder, Bollard, Fish materials, Bim trawl, Individual learning, Biometry ruler, Butane gas tube, Gyro compass, Hammer scraper, Steel putty, Various measuring and control instruments, Marine labor law, Maritime trade law, Drej, Training model, Eccentric sanding machine,			
	Strategies, rules and/or procedures		
-Going to a ship in person and interviewing a seafarer on duty - To investigate the working method and conditions of the ship - Investigating the competence, duties and working conditions of the seafarers you interview - To evaluate whether you can choose the occupation of the person you meet with your personal characteristics, except education, as a professional goal.	In giving this course; Expression, demonstration and practice, question-answer, dramatization methods can be used.		
Assessment: Measuring and evaluating will be done by using measurement tools at the end of the module and lesson in accordance with the regulation for passing the course			
Comments: Master trainers, technicians and professional staff with sector experience in the field of Maritime can be used in the implementation of the program when necessary.			

Dimension: 1. The sea belongs to us 2. Dynamic sea 3. Discover and explore the sea + ++4. Sea and humanity

BLUE SCHOOLS

Topic: Educational methodology		**Subtopic:**	
Contents: The Baltic Sea Day	**Goals:** to highlight important sea-related themes and topics. • to inspire and encourage concrete actions that benefit the Baltic Sea • to celebrate the diversity and immeasurable value of the Sea. • to increase awareness of marine nature, culture and history. One of the key success indicators of the Baltic Sea Day is for us to be able to communicate about the Baltic Sea in a way that engages new audiences and gets people interested in the Baltic Sea!	**Skills:** • The special features of the Baltic Sea, its geographic location, history, and the people who live - and have lived - on its shores make it a place that is unique in the world. "A sea of superlatives" • A treasure trove of stories and memories, the stage of historical events • Test lab for climate change • Moomintroll's beloved sea that belongs to us all • Unique underwater nature and cultural heritage • Cuisine of the Baltic Sea!	**Subject(s):** Geography Biology Physics
Target audience: middle class	**Typology:**	**Duration/Schedule:** 3 hours of practice	
Material:			

Description/Activities	**Strategies, rules and/or procedures**
The event takes place in the internationally popular Bioblitz format, it means nature observers are volunteers who take pictures of the wild species in their homeland at a convenient time and send the collected data to a global biodiversity database within 24 hours, thus supporting research to improve the state of the Baltic Sea. Students identify as many species living in different communities as possible within the 9 countries surrounding the Baltic Sea (Estonia, Latvia, Lithuania, Poland, Germany, Denmark, Sweden, Finland, Russia). There is a strong link between biodiversity conservation and climate change, and achieving the SDGs also requires the use of volunteer citizen scientists to gain an overview of the state of biodiversity. Therefore, biolblitz is an effective way for biodiversity observation information to reach the Global Biodiversity Information Facility (GBIF), where it is freely accessible to all. However, it is also important to keep in mind that the habitats of particularly vulnerable species will not be disclosed when conducting observations with iNaturalist!	Method: Teamwork, working in pairs Watch the YouTube video: https://youtu.be/9sgVrkTHKwE Charge your phone battery fully. Download the app from iNatural and log in via Gmail, Facebook or create a new account. Go outside with your phone, open the iNatural app and discover the surrounding nature! Take pictures of different species, upload them to the app and combine the observation with our observation project "BioBlitz around the Baltic Sea". To join an observation project, first search for our project (by name) in iNaturalist and click the "Join" button. If you have linked your nature observations to our project, we will receive your observation information and you will participate in the prize draw. We raffled off a variety of environmentally friendly practical products.
Assessment: feadback from each team	

Know https://www.youtube.com/watch?v=9sgVrkTHKwE&feature=youtu.be
Comments:

Dimension: ☐ 1. The sea belongs to us ☐ 2. Dynamic sea + 3. Discover and explore the sea ☐ 4. Sea and humanity

Topic: Educational methodology		**Subtopic:**	
Contents: Water Sample	**Goals:** A quality assurance and quality control (QA/QC) plan is necessary to ensure that test results are as accurate and precise as possible. Accuracy refers to how close a measurement is to its true value. Precision means the ability to obtain consistent results.	**Skills:** • practicing the measurement techniques of the protocols; • collecting the water sample or invertebrate sample as directed; • performing tests immediately after collecting the water sample; • carefully calibrating, using and maintaining testing equipment; • following the directions of a protocol exactly as described; • repeating measurements to check their accuracy and to determine any sources of error; • minimizing contamination of stock chemicals and testing equipment ; • checking to be sure the numbers submitted to the GLOBE Student Data Server are the same as those recorded on the Hydrosphere Data Sheets; and • examining your data for reasonableness and anomalies.	**Subject(s):** Geography Chemistry Biology Physics
Target audience: middle class	**Typology:**		**Duration/Schedule:** 3 hours of practice or labwork
Material:			

Description/Activities	**Strategies, rules and/or procedures**
Collecting the Water Sample If students are able to SAFELY reach the water body (within arms' reach), then water temperature, pH, dissolved oxygen, and electrical conductivity measurements can be taken on site (in situ) directly at the water's edge. However, the measurements of alkalinity, salinity, and nitrate require a sample to be taken with a bucket using the bucket sampling procedure. For electrical conductivity, if the temperature of the water sample is outside the range of 20-30˚C, then allow the sample to adjust to the temperature within that range before conducting the measurement. Calibration is a procedure to check the accuracy of testing equipment. For example, to ensure that the pH instruments are functioning properly, a solution of known value is tested. Calibration procedures vary among the measurements and are detailed in each protocol. Certain calibrations must be done in the field just before the measurement is taken. Other calibration procedures are done in the classroom.	Method: Teamwork Collect a water sample in a bucket for testing. Bottle a water sample to take back to the classroom for testing pH, conductivity or salinity, alkalinity, and nitrate. Fill the worksheet.

Assessment: feadback from each team
Know+: Safety: If you are testing potentially contaminated water or using kits with chemicals, latex gloves and safety goggles are strongly recommended.
Comments: Worksheet https://www.globe.gov/documents/11865/920675f5-56c0-46a3-97b5-74f9953b2ae4

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Topic: Educational methodology		**Subtopic:**	
Contents: Water Temperature measurement	**Goals:** To measure the temperature of a water sample	**Skills:** Students will learn, - how to use a thermometer; - examine reasons for changes in the temperature of a water body; - communicate project results with other Blue schools; - collaborate with other Blue schools (within your country or other countries); and - share observations by submitting data to the GLOBE data archive.	**Subject(s):** Geography Chemistry Biology Physics
Target audience: middle class	**Typology:**	**Duration/Schedule:** 3 hours of practice or labwork	
Material:			

Description/Activities	**Strategies, rules and/or procedures**
Science Concepts Earth and Space Sciences Earth materials are solid rocks, soils, water and the atmosphere. Physical Sciences Objects have observable properties. Life Science Organisms can only survive in environments where their needs are met. Earth has many different environments that support different combinations of organisms. Humans can change natural environments. All organisms must be able to obtain and use resources while living in a constantly changing environment. Scientific Inquiry Abilities Use a thermometer to measure water temperature. Identify answerable questions. Design and conduct scientific investigations.Use appropriate mathematics to analyze data. Develop descriptions and explanations using evidence. Recognize and analyze alternative explanations. Communicate procedures and explanations. Supporting Activities: The measurement of water temperature provides a good opportunity for teachers to introduce basic concepts of data accuracy and precision. Data are accurate when the sample average (average of student observations) is equal to the true average. Data are precise when the student observations fall within a narrow range. Results may be accurate, though imprecise, when students have a wide scatter in their observations. Results may be precise, though inaccurate, when student measurements are within a narrow range, but when the mean does not equal the true mean. The Hydrosphere Water Temperature Protocol is designed so that the data students' report are both accurate and precise. Students are required to take at least three measurements and then calculate the mean. If any of the observations fall more than 1.0˚ C away from the mean, the measurement is done again to improve the precision of the data.	Method: Teamwork Advance Preparation: Use the Practicing Your Protocols: Water Temperature Learning Activity to help students explore sources of error in their temperature collection procedure. Make sure that the alcohol-filled thermometer has been calibrated within 3 months. Temperature probes must be calibrated before each use. Materials and Tools: Hydrosphere Investigation Data Sheet Water Temperature Protocol Field Guide Alcohol-filled thermometer or temperature probe Latex gloves Clock or watch Enough string to lower the thermometer into the water Rubber band For Calibration: - Calibrating an Alcohol-filled Thermometer Lab Guide - Thermometer - 400 mL ice - Distilled water - 500 mL beaker
Assessment: feadback from each team	
Know+: Helpful Hints Use the Calibrating an Alcohol-filled Thermometer Lab Guide to check the accuracy of a new thermometer. If the new thermometer is not reading correctly, contact the manufacturer.	

Comments: Worksheet https://www.globe.gov/documents/11865/0fd40183-f2ea-480f-82b6-8d62180d9291

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Topic: The sea and welfare promotion		**Subtopic Routes in Peniche**	
Contents: ◆ Scales; ◆ Measurement; ◆ Direct proportion; ◆ Scientific notation; ◆ Percentagens; ◆ Graphs.	**Goals:** ◆ Solving direct proportion problems in real contexts; ◆ Measuring lengths with different units; ◆ Representing data and interpreting graphs; ◆ Interpreting and analysing information and statistic arguments in a critical way, namely data included in media; ◆ Recognize rational numbers across their multiple representations, including scientific notation with positive exponents in mathematical and non-mathematical contexts.	**Skills:** A - Languages and texts; B - Information and communication; C - Reasoning and problem solving; D - Critical thinking and creative thinking; E - Interpersonal relationship; F - Personal development and autonomy; G - Welfare, health and environment; H - Aesthetic and artistic sensitivity; I - Scientific, technical and technological knowledge; J - Body awareness and mastery.	**Subject(s): Mathematics** (Collaboration with Space and Time Lab - Geography + History - and Information and Communication Technologies)
Target audience: Grade 7 students	**Typology:** Project work		**Duration/Schedule:** 3 weeks
Material: Computer devices with Internet connection for every group of students			

Description/Activities	**Strategies, rules and/or procedures**
Development of a project about Peniche's coastline and/or The Berlengas Islands: **Activity 1** - Dividing the class in small groups (3 or 4 students) and choosing a theme from the list proposed by the teacher, or another theme, chosen by students and considered relevant; **Activity 2** Gathering data from different sources about the chosen theme and exploration of the mathematical content involved in it by each group of students; **Activity 3** Planning routes in Google - *My Maps* (or other) and preparation of the oral presentations to the whole class in interactive and creative ways.	**Specific procedures for each group of students, according to their specific theme:** A – Planning a route in Peniche's coastline and/or The Berlengas Islands, marking points of interest, calculating distances in reality and in the map and explaining which is the scale used in it; B - Planning a route in Peniche's coastline and/or The Berlengas Islands, marking points of interest and presenting the distances between those points in maritime miles and kilometres; C – Planning a route in Peniche's coastline and/or The Berlengas Islands, marking points of interest and estimating the time spent on that route (depending if the person is walking, going by boat, etc.), calculating the number of calories burnt or the quantity of fuel the boat needs to reach its final destination; D – Planning a route in Peniche's coastline and/or The Berlengas Islands, marking points of interest and describing their absolute location using the geographic coordinate system;
Activity 4 Presenting the work to the whole class.	E - Planning a route in Peniche' coastline and/or The Berlengas Islands, marking points of interest and making graphs with topographic profiles, using kilometres, metres, centimetres, etc.; F - Planning a route in Peniche' coastline and/or The Berlengas Islands, marking points of interest included in news in social media and analysing numbers related to the sea pollution in different representations, including scientific notation.
Assessment: the project evaluation considers student's performances (interpersonal relationship, collaboration and student's involvement), the scientific quality of the mathematical aspects included, the global quality of the work and the clarity and creativity of the oral presentation to the whole class; formative evaluation from peers is also analysed.	
Know+: examples of resources students can use and look for: Local news: https://www.dn.pt/lusa/projeto-para-reduzir-lixo-no-mar-recolheu-quase-450-mil-litros-de-residuos-em-peniche-8726247.html Sites with relevant information about the themes: https://www.ativo.com/calculadoras-de-performance/calculadora-de-calorias/ Technological tools: Google – My maps and Google Earth/Google Street View; Google Slides; Screencastify; etc.	
Comments: lesson plan inspired in the interdisciplinary project "Our sea – Berlengas, UNESCO Biosphere Reserve", developed in Agrupamento de Escolas de Atouguia da Baleia in 2019/20.	

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Topic: "Our Sea - Berlengas islands UNESCO Biosphere Reserve"		**Subtopic: "The Sea in the Poetry of Mariano Calado"**	
Contents: *Poetic Text*: research, reading, interpretation of Mariano Calado's Poetry; creation of bibliographies in digital format.	**Goals:** Knowing (Reading and interpretation) the poetry of Mariano Calado; improving the knowledge about the poet and about certain digital tools already used in Languages Laboratory classes.	**Skills:** A - Languages and texts; B - Information and communication; D - Critical thinking and creative thinking; E - Interpersonal relationship; F - Personal development and autonomy; H - Aesthetic and artistic sensitivity; I - Scientific, technical and technological knowledge.	**Subject(s):** Portuguese/ Languages Lab
Target audience: 7th Grade students (2 classes - A and B)	**Typology:** Project work	**Duration/Schedule:** 3 weeks	
Material: Computer /Tablet devices with Internet connection for every group of students			

Description/Activities	**Strategies, rules and/or procedures**
Development of a project about Our Sea - Berlengas islands UNESCO Biosphere Reserve / The Sea in the Poetry of Mariano Calado (local poet). **Activity 1** – Students, in each group (5 elements) will research poems related to the"Sea" and " the Berlengas's islands", in the work of Mariano Calado, a local poet, in books or on the Internet. **Activity 2** – Each group chooses a poem related to the proposed theme and then, in the digital ***languageisavirus*** tool, they make a visual poem about the content of the chosen poem; then insert it on the group's shelf, in the **Padlet**, in PNG format. **Activity 3** – In each working group, they should do a biographical research of Mariano Calado using the **Biteable** tool. They must be creative in the use of the tool and rigorous in bibliographical research! They must take into account, in the work, a conclusion, the bibliography and the Webgraphy used. At the end, the names of the authors of the work must appear. This work must be inserted in the Project **Padlet** shelf. **Activity 4** – After the activities suggested above were carried out (the research of a poem by Mariano Calado, the creation of a visual poem, based on the content of the researched poem, and the production of a **Biteable** based on the biography of Mariano Calado, using the **Thinglink** tool, with the background image of the Berlengas islands, will place the work in strategic locations of the image. After **Thinglink** is done, they put it in the Portuguese layer, on **Google Maps** and on the Project **Padlet**.	Use of the following tools: https://padlet.com https://classdojo.com
Assessment: Formative evaluation considers student's performances throughout the project (on Padlet's plataform and on ClassDojo classroom community) and the final presentations. Self and hetero evaluation.	

Know+:

https://youtu.be/yKW5yNzTQwQ

https://www.rbe.mec.pt/si/pubjson/downAct.jsp?i=12075

http://atb23.net/ficheiros/file/Documentos/nl01.pdf

Comments: lesson plan inspired in the interdisciplinary project "Our sea – Berlengas islands UNESCO Biosphere Reserve", developed in Agrupamento de Escolas de Atouguia da Baleia in 2019/20.

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8. Projects' ideas.

How to launch blue projects that will be implemented by students

- **DAC**: articulated project focusing on one school content where several school subjects can participate;
- **Blue Passport – Treasure Hunting in The Ocean:** digital document, like a passport, where all the activities on the Blue Economy and environmental sustainability are recorded;
- **Scavenger Hunt**: paddy paper activity with QR codes, the content of the activity is related to the local marine heritage;
- **Escape Boat**: interactive game with tasks about the ocean, the main goal of the game is to escape the room;
- **Webinar with specialized technicians**: virtual meeting with professionals on ocean connected jobs in the region (biologist, fisherman, surfer, lifeguard, diver, lighthouse keeper…);
- **A Library with a view to the Ocean**: virtual library with books, films, music and links under the subject of the oceans;
- **Minecraft Education Edition**: creating virtual worlds;
- **Digital Snakes and Ladders**: creating a virtual game dedicated to the Oceans.
- **3D**: developing 3D projects;
- **Exhibition Art steps**: virtual exhibition with the final works developed during the project;
- **Flash Live Event** (flash mob): celebrating the World Oceans Day;
- **Augmented Reality**: with virtual information and real images from the oceans using apps especially built for the project;
- **Digital games**: building digital games through online platforms like Kahoot!, Quizizz, Learning App and others;
- **Stop Motion**;
- **Digital Glossary**.

These project's ideas could support you on engaging stakeholders and create a linkage between the corporate world and school community.

8. Conclusion

In coastal and island areas students live *by* the sea. Furthermore, it is possible that their parents and families live *from* the sea. Because they have been used to live this way in this environment since they are born, they seldom reflect on the ways the sea and the maritime environment and sea-related activities impact their lives, or, on the contrary, how their and human-related activities impact on the maritime environment and the sea life.

The purpose of the Blue school and the lessons/activities, which may take an infinite variety of forms and aims, is to trigger their interest in learning more on how things and activities having to do with the sea operate, what sustainability solutions they may propose and how their lives may improve in the future.

The active engagement of students in the blue school activities has to be a built-in component in the planning of these activities, which have to be practical combining facts with science and values.

Teachers have to plan blue school activities carefully using a variety of educational methodologies and resources, even involving actors and stakeholders of the local community and of course the resources available in the local environment and context, e.g. nautical sporting clubs, shipping companies, NGOs for the preservation of sea environment and sea-life protection, museums, fishing companies etc.

Teachers may combine their disciplines with activities of the blue school. This way, apart from the objectives of the blue school, taking into consideration the practical and real-life character of these activities, they will trigger the interest of students in their disciplines too and achieve their better understanding.

As a value added, by implementing these blue school activities, students will not only learn faster and better the content of their lessons and acquire solid knowledge about their natural, economic, social and cultural environment and how they can preserve and improve it, but they will also have the chance to develop a whole range of skills and competences most useful in their lives. Such skills are teamworking, creativity, innovativeness, problem solving, communication and human relation skills etc. These skills are not just a side effect. They are of great value as they constitute key skills and they have to be carefully taken into consideration in the planning of the blue school activities.

Dear colleagues, fellow teachers we hope this Guide helps you in sailing in the blue school adventure. We wish you the best success and a great fun!!!