Deliverable D 6.5.2
Implementation of selected best practices for education

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Contents

1. Keywords/Concepts

- Best Practices - "are generally-accepted, informally-standardized techniques, methods or processes that have proven themselves over time to accomplish given tasks".[1]
- Education Activities - activities towards acquisition and/or development of "knowledge and skills that one gain from being taught".[2]
- Training Activities - "the process of being taught the skills of a particular job or activity".[3]
- Primary School Level – also designated as elementary school, for children from the age of four or five to eleven to twelve years old.
- Secondary School Level - also designated as high school, for children from the age of twelve or thirteen to eighteen or nineteen years old.
- Tertiary School Level - also designated as higher education, ranging from undergraduate to post-graduate.
- Best practices of educational activities for research vessels - the most commonly used types of educational activities for research vessels, meaning all the activities addressed for students aiming at the acquisition and/or development of knowledge and skills (even with a strong practical component but as part of the educational process), regardless of the educational level they were targeted for (meaning primary, secondary and tertiary level)[4].
- Education activities classification by type[4]:
  - Training of future scientist – education activities with a strong practical component undertaken on-board research vessel cruises aiming at providing practical job-like skills. Such activities, as training cruises and courses, tend to be dedicated to the tertiary school.
  - Promotion of the marine sciences – education activities with a limited job-like skills practical component that aim to bring awareness and understanding to some specific issues of marine research. Such activities, as ocean related school classes experiments/projects and, follow the fleet type of initiatives, are normally oriented for the younger students (primary and secondary school levels).
  - General awareness raising activities – general education activities with the aim of raising awareness to ocean research issues, normally targeting the primary and secondary school levels but which can be also beneficial for the general public and therefore, have no associated job-like skills practical component. This type of activities can take place on-board of docked research vessels, such as research vessels open days, or in a private environment (classroom, house, among others), such as the visioning of a dedicated DVD.
- Ocean Literacy - understanding the ocean's influence on one and one's influence on the ocean.

[1] Wikipedia - http://www.wikipedia.org/
[2] Longman, Dictionary of Contemporary English; 2001
[3] EUROFLEETS Grant Agreement Annex I – Description of Work (DoW); May 6th 2009
[4] EUROFLEETS Deliverable 6.5.1 – Best Practices in Education

2. Background/Objective

The EUROFLEETS project aims at "bringing together the existing European research fleet owners, to enhance their coordination and promote the cost-effective use of their facilities in order to support the efficient provision of essential research services for monitoring and sustainable management of the Regional Seas and the Oceans"[5].

In this context, the EUROFLEETS project aiming, to "increase employment through education and training"[5] and aware of the lack of well-trained people in new technologies and equipment, intends "to stimulate vocations in marine science and technology"[5] through the development of, among others, education activities for research vessels, taking therefore advantage of its consortium (manly composed of research fleet owners) and of the excellence and innovation of the marine research and technology produced by the Project.

In order to accomplish this objective, the EUROFLEETS project aimed to implement an education activity for research vessels based on a pre-assessment of the "existing best practices among the EUROFLEETS Partners and other relevant parties"[6], "during one of the research cruises organised by WP8 and 9 "TNA1 and 2" or taking advantage of other suitable opportunities"[6].

Conversely, due to constraints regarding the use of the EUROFLEETS funded cruises for the implementation of education activities and the lack of other suitable opportunities at the due date of this deliverable (month 36 – August 2012), it was decided that the current deliverable would focus on guidelines for the implementation of education activities, based on the previous assessment of the existing best practices in education activities for research vessels[6].

In June 2013 however, EurOcean as Task 6.5.- Education Activities leader, in collaboration with Professor Luis Menezes Pinheiro from the Centre for Environmental Studies and the Sea (CESAM), University of Aveiro and FCT Beneficiary representative developed and implemented a education activity on-board "Caravela Vera Cruz", an exact replica of the ancient caravels used in the Portuguese Age of Discovery.

Subsequently, the present deliverable will not only describe principles and guidelines for the implementation of an education activity, but also report on the implemented activity.

3. Education Activity Principles

Due to its multidisciplinary nature, the ocean and its exploration constitute a unique topic to promote and to stimulate vocations in marine science technology, engineering and mathematics, also providing vivid examples of the usefulness of concepts of biology, physical and Earth sciences in the real world. Ocean exploration also provides an appealing context for ocean literacy improvement.

Being research vessels a primary vehicle for increasing knowledge of the ocean, they provide a unique medium for educational and outreach activities, especially when considering that field and laboratory experiments, including the interaction with scientists and technicians, allow students develop an awareness of the importance of the ocean while gaining a first-hand exposure to science/technology and marine and maritime vocations.

[5] EUROFLEETS Grant Agreement Annex I – Description of Work (DoW); May 6th 2009
[6] EUROFLEETS Deliverable 6.5.1 – Best Practices in Education; July 2011

Additionally such educational activities also increase awareness of the Fleets and associated Equipment and their interest in human life and the environment and contribute to enhance awareness of the real economic contribution of marine resources.

An assessment of the previously identified education activities for research vessels developed at European and International level (total of 64 identified activities), revealed that "the majority of the developed education activities for research vessels are dedicated to the tertiary school level", while "the primary school level is by far the least tackled in these types of education activities"[8].

Taking into consideration that children's natural curiosity about the world around them has often faded by ninth grade[7] (14 years-old), education activities should be develop as to early capture children's attention and to continuously nurture their innate scientific curiosity.

Consequently education activities should first and foremost address the primary school level as to captivate the students' interest as early as possible, however within the EUROFLEETS scope of aiming to stimulate vocations in marine sciences and technology, the secondary school level should also be consider as the higher level of education allows for a higher awareness and understanding of marine research and consequently, of the different vocations in the field. This is supported when analysing the type of education activities for research vessels developed for this school level as the majority of the developed activities are of P*romotion of the Marine Sciences*[8], this is, education activities with a job-like skills practical component.

Therefore, and taking into consideration the positive evaluation of this type of activities, the implementation of P*romotion of the Marine Sciences* education activities for research vessels at European level towards the secondary school level will greatly stimulate vocations in marine science and technology. However the primary school level should not be neglected and consequently, tailored P*romotion of the Marine Sciences* education activities should be developed and implemented for both levels.

4. Education Activity Concept and Components

From the analysis of the existing best practices (EUROFLEETS Deliverable 6.5.1 – Best Practices in Education; July 2011), it is clear that a multitude of activities are possible such as, experimental scientific cruises; living history at sea; following the fleets; research vessel open days; visioning of dedicated DVD, as well as activities addressed to solely to teachers.

The development of education activities should not only stimulate vocations in marine science and technology but also aim to produce the maximum possible impact, taking also into consideration the maximization of the efforts as to reach a vaster audience as possible.

In this context, the proposed education activity is a combination of the most developed education activities proven to be successful taking advantage of indoor knowledge and infrastructures and, that can be tailored according to the interest and objectives of the organisations responsible for the activity implementation, and hence susceptible to be implemented by the majority if not all of the project's beneficiaries).

[7] McManus, D.A. et al. (2000) Center for Ocean Science Education Excellence: Report of a Workshop Sponsored by the National Science Foundation. Ocean Springs. MS: University of Southern Mississippi.
[8] EUROFLEETS Deliverable 6.5.1 – Best Practices in Education; July 2011

The proposed education activity addresses not only the scientific component but also the social and cultural heritage aspects, aiming to further raise awareness of the importance of the ocean and of marine studies and their wider implications in the daily-life, as well as to promote the involvement/interaction of/with different societal actors dealing with the marine sciences and technologies, hence exposing the students to difference marine related vocations.

4.1. Scientific Component

The objective of this component is to introduce students in hands on approach to marine sciences and technology matters, ranging from biological sciences, physical oceanography to geophysical sciences dependent on the science field(s) and interest of the activity organizer; to science/technology and marine and maritime vocations, apart from the research vessel itself as the main infrastructure in ocean research.

In this context the scientific component of proposed education activity is comprised by the following sub-components:

- a theoretical introduction to research vessels and their role in marine sciences, including a brief history of the chosen research vessel;
- a theoretical introduction to navigation concepts;
- a theoretical introduction to the chosen marine sciences and technology matter(s), their importance and the methods chosen for the activity;
- a small practical scientific campaign aiming to introduce and familiarize the students with practical research methods and equipment of the chosen marine sciences, as well as technology matters and,
- the development of campaign reports, campaign videos and news.

The implementation of education activities onboard research vessels tends to be limited to a relatively low number of participants due to the nature of the infrastructure, its associated costs and, the limited availability of the required scientific and technical personnel.

The proposed procedure for the selection of the participating school students is either a local, regional or national contest, the reason being of reaching a wider audience and thus being an additional opportunity to promote and enhance awareness and knowledge of the marine sciences and technologies. The theme of the contest can range from the development of a scientific project, to compositions on the importance of the chosen marine research and technology field(s), to artistic materials (drawing, videos, etc.) on the importance of the ocean, to be tailored in accordance with the interests and objectives of the organisers.

In addition, such a contest could also promote the inclusion of ocean and/or marine sciences and technologies issues in the schools activities/curriculums.

Regardless of the school student's selection procedure, a dedicated webpage should be developed and hosted by the activity organizers as part of their institutional website, to announce the educational activity and its results, including the student's campaign report, videos and news. Additional, basic information on the ocean and on the chosen marine science and technology field(s) should also be displayed, contributing therefore to the promotion of ocean literacy not only towards the school students but also the public at large.

Accordingly, the basic requirements for the implementation of the scientific component of the proposed education are:

- access to a research vessel and scientific equipment availability – taking advantage of the fact that the majority of the EUROFLEETS beneficiaries are research vessel owners/operators;
- scientists availability – for the implementation of the small practical scientific campaign and for the contest applications evaluation (if implemented) - taking advantage of the fact that the majority of the EUROFLEETS beneficiaries are research institutions;
- dedicated webpage - taking advantage EUROFLEETS beneficiaries institutional websites;
- contact with the local; regional and/or national schools and,
- information pack such as technical factsheet; educational brochure with the theoretical introduction to research vessels and/or to the chosen marine sciences and technology matter(s); assessment of activity questionnaire, etc..

4.2. Social and Cultural Heritage

The objective of this component is to provide a societal context of the importance of the ocean and to further raise the student's awareness of the importance of the marine studies and its implications in the local daily-life, as well as, to promote the involvement/interaction with different societal actors dealing with the marine sciences and technologies.

In this context, the social and cultural heritage component of proposed education activity can be devised regardless of the scientific matter(s) chosen by the activity organisers, dependent on the local reality and objectives of complementarily of the scientific component or of enlargement of the scope of marine-related activities.

Possible activities of the social and cultural heritage component of proposed education activity can single or a combination of visits to relevant local museums and other ocean related infrastructures/sites, such as marine aquariums; lighthouses; shipyards; or fishing docks and, visits to ocean related/dependent companies such as seafood processing; marine biotechnology; marine pharmaceutical; marine sports association or cruises/transportation companies.

The basic requirements for the implementation of the social and cultural heritage component of the proposed activity, solely dependent on the local reality, are the identification of relevant venues and, the establishment of contacts with the local chosen venues.

4.3. Practical Organisation

The two components are proposed to take each half a day as to allow students to conduct the educational activity in a single day, or if more suitable in two half days. This way it would also allow extending the educational activity to a larger number of students, implying however a greater availability of researchers and of the technical personnel as to be able to conduct both components of the activity at the same time (i.e. while one group of students would start the day with the scientific component followed by the social component, another group of students would start the day by the social and cultural heritage component of the activity).

Additionally, although the scientific component of the activity can be entirely supported by the activity organiser as part of their daily activities, in particular in the case for the EUROFLEETS beneficiaries as vessel owners/operators, the social component can require additional funds and therefore, sponsorship is advised.

The costs of this activity are nevertheless foreseen to be not substantial as the main cost would be for the charter, if needed, of a research vessel. Although research vessels availability is limited for these type of activities, a regular small scale implementation of this activity would create a significant impact in the targeted audience, especially if a dedicated website and selection contest would be also implemented.

The proposed activity took also into consideration different needs/constraints from both the organisers and the participants. In this context the activity could be adaptable in terms of the available resources and hence could be implemented throughout the school year, this is the implementation of the scientific component and of the social and cultural heritage component in different periods of the year (which could lead to a better integration in the schools curricula) or, although not recommended, could be condensed as to be developed in a single half-day by decreasing the number of subjects approached and/or by not running on-board research activities, or even by running the scientific component in a docked vessel.

Moreover the development of the materials could be solely developed in-house thus reducing the associated costs or, could be developed in collaboration with local universities/institutions.

Another point to take into consideration is the location of the activity which, without detriment off safety, should be as representative as possible of the normal research activities subject to the educational activity and, advisable, should also include some points of interest such as shipwrecks, tidal sand waves among others.

5. Implementation of the Education Activity

EurOcean as responsible for the Task 6.2 – Education activities, in collaboration with Professor Luis Menezes Pinheiro from the Centre for Environmental Studies and the Sea (CESAM), University of Aveiro and FCT Beneficiary representative, developed and implemented on May 13th to 15th an education activity case study based on the previously presented guidelines.

The undertaken activity counted also with the support of the Centre of Oceanography (CO) from the University of Lisbon and, APORVELA (responsible for the vessel used in the activity).

5.1. Education Activity – Methodology

The implemented education activity, aimed to encourage students of the primary and secondary school level to perceive the role of ocean scientific exploration as well as the role of research vessels and, of the Portuguese maritime heritage as one of the country's greatest values.

Although also targeted for the primary school level, the aim of chosen implemented activity was of P*romotion of the Marine Sciences* type and not only *a General awareness raising activities,* and hence the chosen target audience was school students of the intermediate levels of the primary school and of the secondary school, this is, with age ranges between 8 to 18 years old.

The implemented activity followed the proposed guidelines only differing in the participating students' selection procedure due to time and budgetary constraints. As such, the activity was only opened to Portuguese Students of schools with privilege contacts with EurOcean and University of Aveiro and consequently no contest was open.

Additionally the undertaken activity focused not only on one but on several marine research topics since ocean literacy is not a component of the Portuguese curricula. Therefore a multidisciplinary approach was given to the activity as to involve as many contents possible namely from Natural Sciences (mainly geology), Mathematics (Navigational Instruments) and History (Portuguese Discoveries).

The activity was thus undertaken with the support of the teachers' professional capacity to explicitly assess and match the curriculum in order to respond to the needs of educationally disadvantaged students.

5.2. Education Activity – Programme

As previously mentioned the implemented activity, entitled *to the research of the ocean and seabed on board of the caravel "Vera Cruz",* followed the proposed guidelines, developed based on the assessment of the existing best practices. Subsequently the implemented educational activity was composed of a scientific and a social and cultural heritage component.

The scientific program of the cruise was organized by Professor Luís Filipe Menezes, scientist at the Centre for Environmental Studies and the Sea (CESAM), University of Aveiro, and focused on:

a) Presentation of Key Concepts

- Safety Rules on board;
- Introduction to the history of the "Vera Cruz" Caravel and its importance in the Portuguese discoveries;
- The importance / necessity of Research Vessels in Marine Science;
- Introductory concepts of Navigation and Positioning Systems;
- Importance of the study of the Seabed Geology and Sub-surface, in particular what concerns the study of mineral and energy resources, the plate tectonics and geological risks, and archaeological heritage;
- Importance of Physical Oceanography for the study of the physical properties of the ocean, in particular, currents, temperature and salinity, and their implications for ocean-atmosphere interaction;
- Explanation of the geophysical methods, mainly Side Scan Sonar and reflection profiles of High-Resolution seismic - Chirp Sonar;
- Presentation of the methods used in Physical Oceanography to measure the temperature and salinity of the water column (CTD) and currents (current meter).

b) Monitoring of data acquisition during cruise and observation of the equipment used:

- Real-time acquisition of profiles of side-scan sonar and high resolution seismic of reflection - Chirp Sonar.
- Acquisition in real-time of temperature and salinity profiles (CTD) and current profiles (current meter).

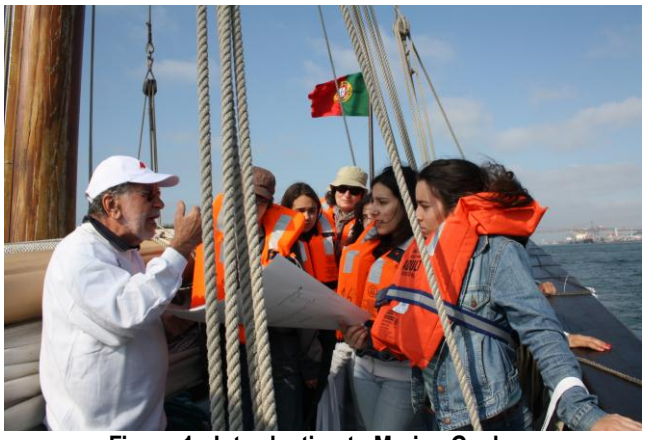


Figure 1 - Introduction to Marine Geology

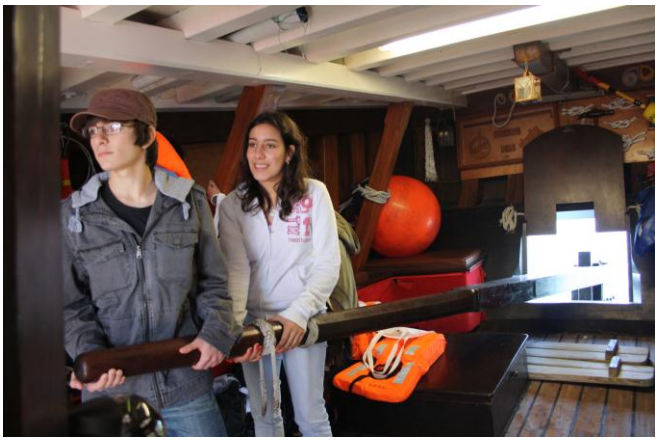


Figure 2 - Students on the Helm

The social and cultural heritage program was organized by EurOcean in collaboration with Professor Luís Filipe Menezes (CESAM,-University of Aveiro) and counted not only with the Portuguese Discoveries linked to the history of the chosen vessel, component presented by APORVELA, but also with a visit to the Portuguese Navy Museum (http://museu.marinha.pt/pt/Paginas/default.aspx).

The Portuguese Navy Museum is not exclusively dedicated to naval military affairs but is also responsible for the safeguarding and the dissemination of the Portuguese maritime heritage. Hence the choice of this activity as it would provide students with a deeper understanding of the various aspects of human activities related to the sea in addition to the scientific ones.

This activity was however not mandatory due to the different geographical origin of the various students (please refer to point 5.5 – Education Activity – Target Group and Participants) and their limited time availability.

Envisioning this possibility, this factor was also taken into consideration upon the choice of the vessel as, even if school students were not able to participate in the dedicated social and cultural heritage component, they would still have an introduction through the Portuguese Discoveries linked to the history of the “Caravela Vera Cruz”.

Nevertheless, the participation in the social and cultural heritage component, implemented in one half-day, was encouraged by the activity organizers.

5.3. Education Activity – Vessel and equipment

The multidisciplinary *Introduction to the research of the ocean and seabed on board of the caravel "Vera Cruz* educational activity took place on May 13th to 15th 2013 on-board of the "Caravela Vera Cruz", which is a replica of the ancient caravels used in the Portuguese Age of Discovery (please refer to Figure 3).

The caravel, built in the shipyard of Vila do Conde for the celebration of the 500th anniversary of the discovery of Brazil, is owned by the Portuguese Association of Sail Training (APORVELA), and is mainly intended for training of at sea of children and, for the investigation of the behaviour and maneuver of the ancient caravels.

Despite the fact that the caravel had not before been used in scientific educational activities, due to relevance of the vessel for the Social and Cultural Heritage component of the educational activity, this vessel was specifically chosen and several contacts were made with APORVELA as to ensure all needs of a scientific educational cruise were meet.

A component on basic safety principles; the history of the caravel, including on the associated Age of Portuguese Discovery and life on-board and on, the "Caravela" navigation and maneuvering concepts were thus meet and conducted by the APORVELA team itself. The APORVELA team was also responsible for the maneuvering of the vessel and deployment of the equipment.

In addition APORVELA further supported the implemented educational activity by settling a special access fee of 1/3 of the normal cost, recognizing the importance such activities.

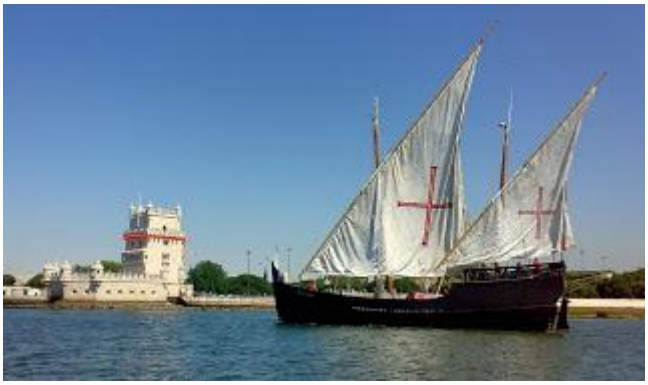


Figure 3 - Caravel "Vera Cruz"

As to explain the methods employed in the seabed geology and physical oceanography research, three types of equipment were deployed.

In the scope of the Physical Oceanography a CTD and a Current meter were used to measure the temperature and salinity of the water column and currents (current meter) while, for the marine geophysics a Towed Combined Chirp/Side Scan Sonar System was used. In both cases real-time data was acquired and showed to the participants.

As previously mentioned the caravel was never used for a scientific educational cruise, and consequently a 3 day testing cruise was conducted in April 2013 as to deal with the deployment constrains.

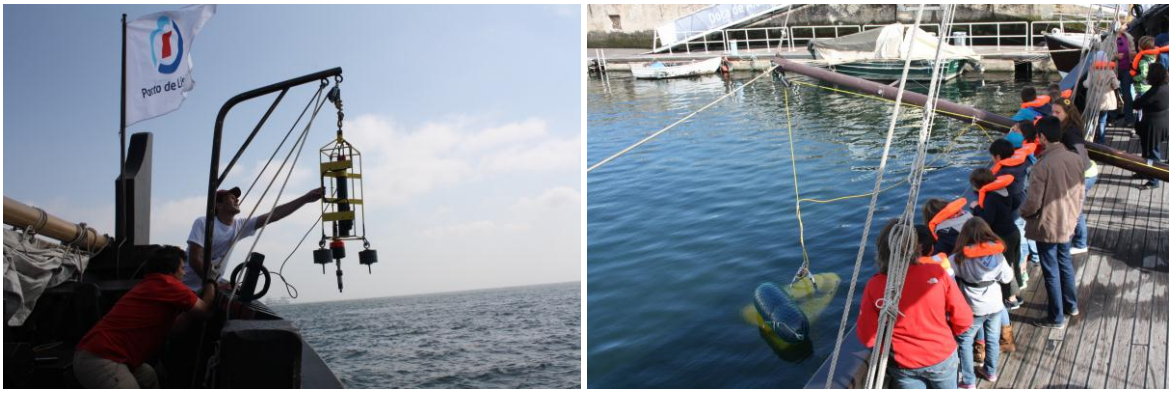


Figure 4 - Equipment's on Board. From left to right: CTD Sensors, Towed Combined Chirp and Side Scan Sonar Systems

5.4. Education Activity – Area of study

The educational activity, which took place on May 13th to 15th 2013, was carried out in an area of the Tagus River estuary comprised between the "Santa Apolónia" train station and the bridge "25 de Abril" (please see Figure 5).

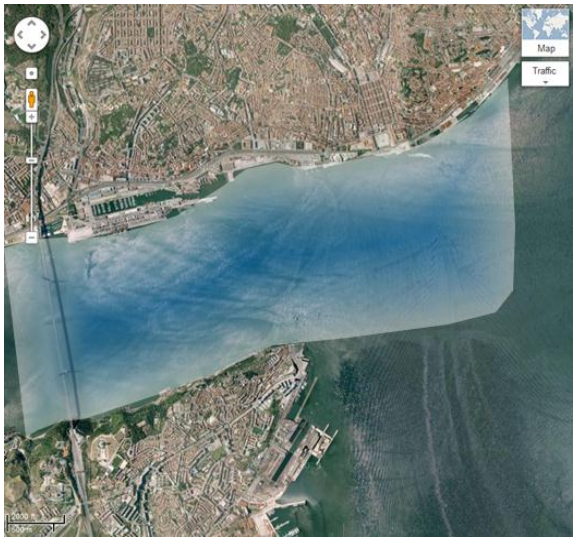


Figure 5 - Area of Study

The area was chosen taking into consideration that:

- the area chosen should contain enough points of interest to motivate all the participants;
- while it would be ideal to take students to the opean sea the security factor of the participants should also be taken into consideration.

The case study area was chosen considering the availability of the vessel chosen for the activity and, upon consultation with Professor Luís Menezes Pinheiro (researcher at CESAM-University of Aveiro) and FCT beneficiary representative, who conducted a testing cruise in April 2013 to access the quality of data that could be acquired and seen by the students. During this campaign sites of shipwrecks, faults and tidal sand waves were identified has points of interest, and mapped for further use during the educational activity.

5.5. Education Activity – Target group and participants

As previously mentioned, the activity was organized as to raise awareness and understanding of the primary and secondary school level students for the role of ocean scientific exploration as well as the role of research vessels and, of the Portuguese maritime heritage.

The aim was also to tackle a taster audience as possible and, in this context, the following considerations for the selection of the schools were considered:

- Geographic segmentations (it was considered important to represent the geographic diversity of the country – consequently two schools from the north, and two schools from centre of the country were chosen);
- Socioeconomic segmentation (it was considered important to represent all socioeconomic backgrounds) and,
- Age segmentation (classes were chosen to involve students from 8-18 years old, as described in table 1).

However due to time and budgetary constraints the educational activity was only opened to Portuguese Students of schools with privilege contacts with EurOcean and University of Aveiro, taking into consideration the above mentioned considerations.

Contacts with schools were therefore undertaken to find a suitable date and to identify the participating classes. The students' teachers were fundamental not only to match the curriculum with the activity, but also to facilitate the communication between the organization and the students' guardians.

In the end, a total of 126 students from four cities of the country, with ages between 9-18 years old, met to recognize the importance of oceanographic research vessels, positioning systems and sciences dedicated to oceanographic research, with particular attention to the Marine Geology and Geophysics and Physical Oceanography.

Table1. Description of the Participants in the Educational Activity.

School	Contact Teacher	Grade	N. Students	N. Teachers	Date
Escola Básica e Secundária de Lanheses, VIANA DO CASTELO	Ricardo Carvalhido	7	31	3	13-May
Escola Josefa de Óbidos, LISBOA	Duarte Sogalho	12 and 11	21	3	14-May
Escola Secundária José Macedo Fragateiro, OVAR	António Gonçalves	10	29	2	14-May
Escola EB72, Padre Bartolomeu de Gusmão, LISBOA	Jorge Ferreira	4	24	3	15-May
Agrupamento Martim de Freitas, Escola B23, COIMBRA	Patrícia de Jesus	8	20	3	15-May

5.6. Education Activity – Additional Constraints and Solutions

Upon contacts with the selected schools, EurOcean became aware of budgetary constraints regarding the displacement of the students. In this context and after analysing the available budget, it was decided that EUROFLEETS would support half of the transportation costs to a maximum of 250€, as to not jeopardize the implementation of the activity. Four out of the five schools, include one based in Lisbon – the one with the younger students for safety reasons, requested this support.

The participation of the younger students brought an additional constraint as the "Vera Cruz" caravel was not equipped with life jackets appropriate for their size. The primary school level was however always considered a priority and for this reason, the EUROFLEETS project supported the costs as to not jeopardize the implementation of the activity for this school level.

5.7. Education Activity – Developed Materials

In line with the proposed guidelines, several specific EUROFLEETS products were developed. These products, presented in the Annex, mainly focused on basic information on the activity itself and on general information about research vessels as the chosen vessel as, previously stated, was not a dedicated marine research vessel.

The developed materials were the following:

- Technical factsheet;
- Educational Brochure – Do you know that? (PT only);
- Educational quizzes' (PT only);
- EUROFLEETS canvas and,
- Institutional Bags with project logo.

5.8. Education Activity – Associated Costs

The activity was developed as to minimize as much its associated costs. However as the activity responsible, EurOcean and CESAM-University of Aveiro, are not a vessel owners/operators, a substantial part of the budget was dedicated to the charter of the caravel.

Additionally, the security and mobility constraints accounted for circa of 17% of the total activity cost, costs that similarly to the charter of the vessel could be minimized or even disregarded if the activity would be implemented by a vessel owner/operator and if the students' age and geographical scope would be limited.

Nevertheless the total cost associated with the activity, described in Table 2, is relatively reduced showing that such activities can be implemented by almost any interested institution.

Table2. Activity Associated Costs.

Expense	Associated Cost (€)
Chartering of the "Caravela Vera Cruz"	3.000,00
Printed Materials Development	1.220,50
Safety Equipment Acquisition	260,10
Equipment Transportation	950,00
Organizers Travel Expenses	396,00
Students Transportation	883,00
Total	**6.709,60**

5.9. Education Activity – Dissemination

Although a specific webpage was not developed neither by the organisers neither by the EUROFLEETS project itself, the activity was disseminated via dedicated news articles displayed in the project's Internet "Hub"; University of Aveiro's website and FCT's website.

Moreover the Portuguese media was contacted and as a result the education activity on board a replica of a Portuguese caravel from the XVI century, considered to be extremely interesting and important, was closely followed by the Portuguese media and disseminated by multiple on-line channels both at local and national level, namely:

a) **Newspapers**
- Jornal da Bairrada - http://www.jb.pt/2013/05/caravela-leva-alunos-do-basico-e-secundario-em-expedicao-cientifica-no-tejo/
- Expresso do Oriente - http://expressodooriente.com/?p=10667

b) **Information posted on the internet hub**
- Forum Estudante - http://www.forum.pt/estudantes/noticias/8089-navegar-numa-caravela-dos-descobrimentos

c) **TV Broadcasted News**

- TVI - http://www.tvi24.iol.pt/videos/video/13867377/1
- RTP - http://www.rtp.pt/noticias/index.php?article=651678&tm=8&layout=123&visual=61

6. Final remarks

The implemented activity was an example on how it is possible to prepare a very complete training activity at low cost. If considering that the majority of the EUROFLEETS beneficiaries are vessel owners/operators, the cost of such activities can even be further reduced.

From the feedback of professors and students it was clear that the combination between science and cultural heritage is a factor of motivation and enrichment, as evident by an example of a 11th grade student's evaluation: "This activity was interesting in several aspects, I've learned a lot of things on issues I had no clue about, mainly on the Sea Basins, Seabed Geology, Physics Oceanography, Navigation and GIS systems. But what I've liked more was to learn about the History of the "Vera Cruz" caravel, about the life on-board, and the importance of this vessel in the Portuguese Discoveries. Also liked to be on the helm and learn how to tie some knots. Really liked this activity, and would love to repeat it."

7. Annex 1 – Materials Developed for the Activity

7.1. Technical factsheet

Eurofleets

ACTIVITY OF EDUCATION ON MARINE SCIENCE AND TECHNOLOGY ON BOARD OF A VESSEL.

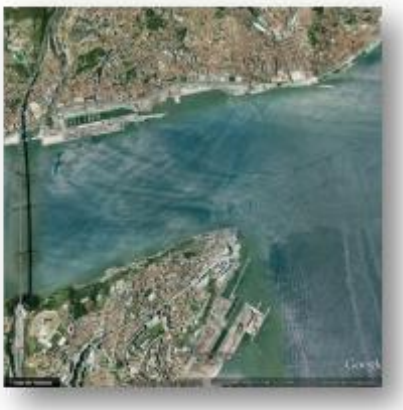
EUROFLEETS TASK 6.5

TECHNICAL FACTSHEET

1. NAME OF THE ACTIVITY: Introduction to the research of the ocean and seabed on board of the caravel "Vera Cruz"

Caravel "Vera Cruz", from Aporvela.

2. VENUE OF THE ACTIVITY: Tagus estuary, between the Area of Santa Apolónia and the 25 de Abril.



Organization: CESAM

Collaboration: APORVELA

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3. DATES OF THE ACTIVITY: 13-15 May 2013.

4. RESPONSIBLE INSTITUTION: FUNDAÇÃO EUROCEAN

5. RESPONSIBLE INVESTIGATOR: PROF. LUIS MENEZES PINHEIRO (UNIVERSITY OF AVEIRO).

6. SCIENTIFIC SUPERVISION:

PROF. LUIS MENEZES PINHEIRO, UNIVERSITY OF AVEIRO

PROF. ISABEL AMBAR, UNIVERSITY OF LISBON

7. ORGANIZATION OF THE ACTIVITY: UNIVERSITY OF AVEIRO (DEPARTMENT OF GEOSCIENCES AND ASSOCIATED LABORATORY CESAM) AND FUNDAÇÃO EUROCEAN

8. COOPERATING INSTITUTIONS: INSTITUTE OF OCEANOGRAPHY, UNIVERSITY OF LISBON E APORVELA.

9. ACTIVITIES ON BOARD OF THE VESSEL:

9.1 Presentation of Key Concepts

- Safety Rules on board;
- Introduction to the history of the "Vera Cruz" Caravel and its importance in the Portuguese discoveries;
- The importance / necessity of Research vessels in Marine Science;
- Introductory concepts of Navigation and Positioning Systems;
- Importance of the study of the Seabed Geology and Sub-surface, in particular what concerns the study of mineral and energy resources, the plate tectonics and geological risks, and archaeological heritage;
- Importance of Physical Oceanography for the study of the physical properties of the ocean, in particular, currents, temperature and salinity, and their implications for ocean-atmosphere interaction;
- Explanation of the geophysical methods, mainly Side Scan Sonar and reflection profiles of High-Resolution seismic - Chirp Sonar;
- Presentation of the methods used in Physical Oceanography to measure the temperature and salinity of the water column (CTD) and currents (current meter).

Organization: CESAM universidade de aveiro

Collaboration: APORVELA

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9. 2 Monitoring of data acquisition during cruise and observation of the equipment used:

- Real-time acquisition of profiles of side-scan sonar and high resolution seismic of reflection - Chirp Sonar.
- Acquisition in real-time of temperature and salinity profiles (CTD) and current profiles (current meter).

9.3 Educational quizzes

- In the Script of the visit was included a series of questions about the concepts and fundamental knowledge acquired aboard. These questions should be answered by the students on board and corrected later by Teachers of Schools.

10. PARTICIPANTS:

SCHOOL	Responsible teacher	Grade	Nº Students	Nº Professors	Date of the activity	Time
Escola Básica e Secundária de Lanheses, VIANA	Ricardo Carvalhido	7	31	3	13-May	14-18H
Escola Josefa de Óbidos, LISBOA	Duarte Sogalho	12 e 11	21	3	14- May	09-13H
Escola Secundária José Macedo Fragateiro, OVAR	António Gonçalves	10	29	2	14- May	14-18H
Escola EB72, Padre Bartolomeu de Gusmão, LISBOA	Jorge Ferreira	4	24	3	15- May	09-13H
Agrupamento Martim de Freitas, Escola B23, COIMBRA	Patrícia de Jesus	8	20	3	15- May	14-18H

Organization: Ocean CESAM Universidade de Aveiro

Collaboration: APORVELA

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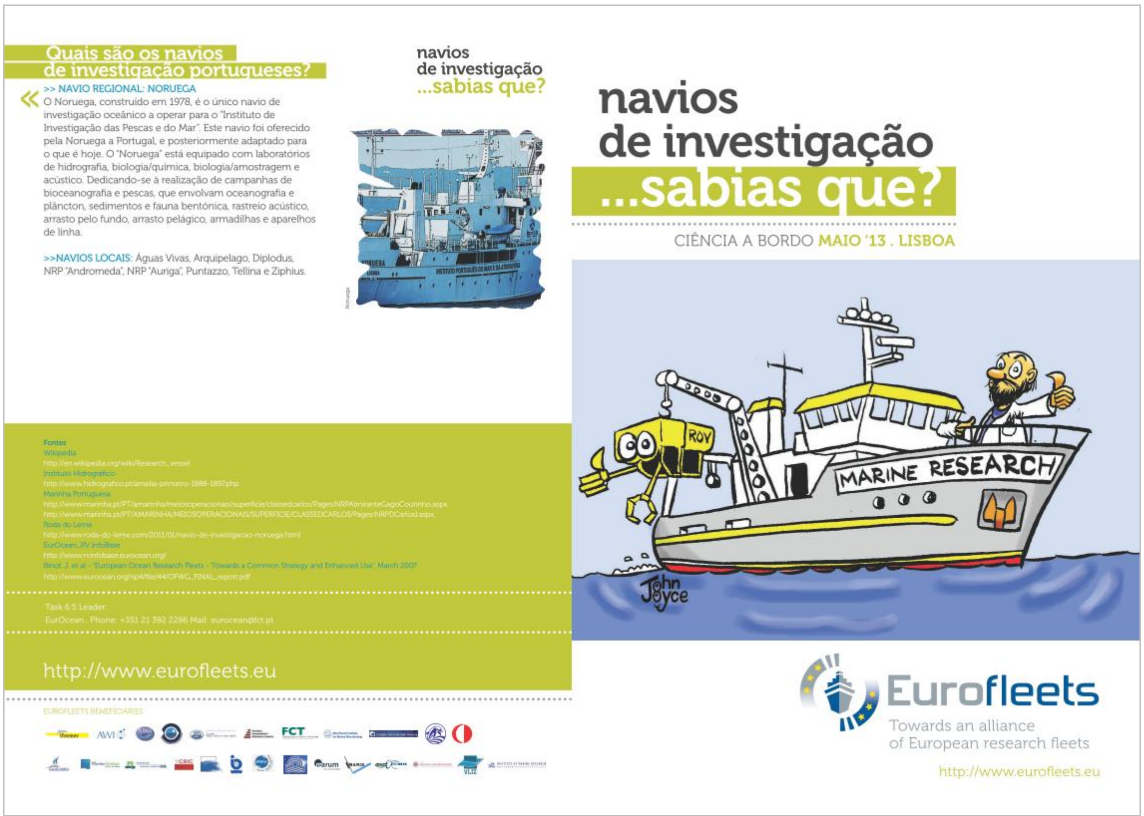
7.2. Educational Brochure – Do you know that?



Quais são os navios de investigação portugueses?

>> NAVIO REGIONAL: NORUEGA

O Noruega, construído em 1978, é o único navio de investigação oceânico a operar para o "Instituto de Investigação das Pescas e do Mar". Este navio foi oferecido pela Noruega a Portugal, e posteriormente adaptado para o que é hoje. O "Noruega" está equipado com laboratórios de hidrografia, biologia/química, biologia/amostragem e acústico. Dedicando-se à realização de campanhas de bioceanografia e pescas, que envolvam oceanografia e plâncton, sedimentos e fauna bentónica, rastreio acústico, arrasto pelo fundo, arrasto pelágico, armadilhas e aparelhos de linha.

>>NAVIOS LOCAIS: Águas Vivas, Arquipelago, Diplodus, NRP "Andromeda", NRP "Auriga", Puntazzo, Tellina e Ziphius.

navios de investigação ...sabias que?

Noruega

Fontes
Wikipédia
http://en.wikipedia.org/wiki/Research_vessel
Instituto Hidrográfico
http://www.hidrografico.pt/amelia-primeiro-1888-1897.php
Marinha Portuguesa
http://www.marinha.pt/PT/amarinha/meiosoperacionais/superficie/classedcarlos/Pages/NRPAlmiranteGagoCoutinho.aspx
http://www.marinha.pt/PT/AMARINHA/MEIOSOPERACIONAIS/SUPERFICIE/CLASSEDCARLOS/Pages/NRPDCarlosI.aspx
Roda do Leme
http://www.roda-do-leme.com/2011/01/navio-de-investigacao-noruega.html
EurOcean_RV InfoBase
http://www.rvinfobase.eurocean.org/
Binot, J. et al - "European Ocean Research Fleets - Towards a Common Strategy and Enhanced Use", March 2007
http://www.eurocean.org/np4/file/44/OFWG_FINAL_report.pdf

Task 6.5 Leader:
EurOcean . Phone: +351 21 392 2286 Mail: eurocean@fct.pt

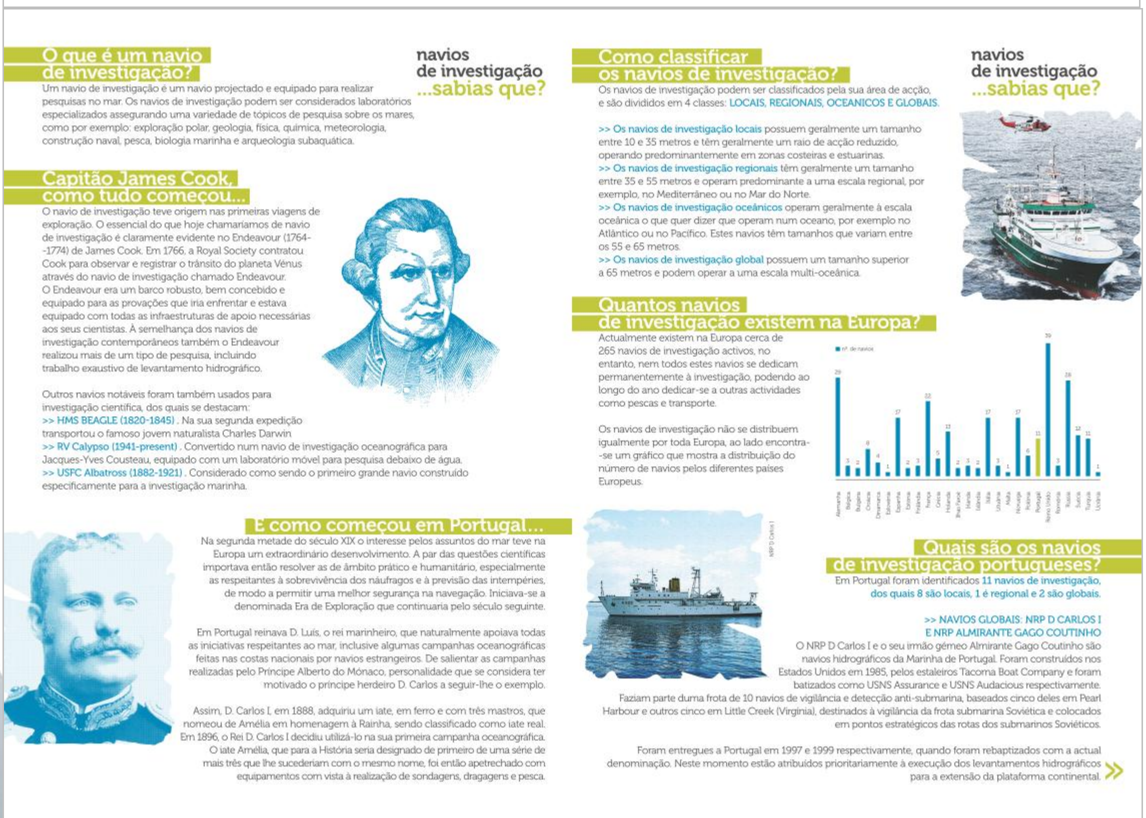
http://www.eurofleets.eu

EUROFLEETS BENEFICIARIES

navios de investigação ...sabias que?

CIÊNCIA A BORDO MAIO '13 . LISBOA

Eurofleets
Towards an alliance of European research fleets
http://www.eurofleets.eu



O que é um navio de investigação?

Um navio de investigação é um navio projectado e equipado para realizar pesquisas no mar. Os navios de investigação podem ser considerados laboratórios especializados assegurando uma variedade de tópicos de pesquisa sobre os mares, como por exemplo: exploração polar, geologia, física, química, meteorologia, construção naval, pesca, biologia marinha e arqueologia subaquática.

navios de investigação ...sabias que?

Capitão James Cook, como tudo começou...

O navio de investigação teve origem nas primeiras viagens de exploração. O essencial do que hoje chamaríamos de navio de investigação é claramente evidente no Endeavour (1764--1774) de James Cook. Em 1766, a Royal Society contratou Cook para observar e registrar o trânsito do planeta Vénus através do navio de investigação chamado Endeavour. O Endeavour era um barco robusto, bem concebido e equipado para as provações que iria enfrentar e estava equipado com todas as infraestruturas de apoio necessárias aos seus cientistas. À semelhança dos navios de investigação contemporâneos também o Endeavour realizou mais de um tipo de pesquisa, incluindo trabalho exaustivo de levantamento hidrográfico.

Outros navios notáveis foram também usados para investigação científica, dos quais se destacam:
>> HMS BEAGLE (1820-1845) . Na sua segunda expedição transportou o famoso jovem naturalista Charles Darwin
>> RV Calypso (1941-present) . Convertido num navio de investigação oceanográfica para Jacques-Yves Cousteau, equipado com um laboratório móvel para pesquisa debaixo de água.
>> USFC Albatross (1882-1921) . Considerado como sendo o primeiro grande navio construído especificamente para a investigação marinha.

E como começou em Portugal...

Na segunda metade do século XIX o interesse pelos assuntos do mar teve na Europa um extraordinário desenvolvimento. A par das questões científicas importava então resolver as de âmbito prático e humanitário, especialmente as respeitantes à sobrevivência dos náufragos e à previsão das intempéries, de modo a permitir uma melhor segurança na navegação. Iniciava-se a denominada Era de Exploração que continuaria pelo século seguinte.

Em Portugal reinava D. Luís, o rei marinheiro, que naturalmente apoiava todas as iniciativas respeitantes ao mar, inclusive algumas campanhas oceanográficas feitas nas costas nacionais por navios estrangeiros. De salientar as campanhas realizadas pelo Príncipe Alberto do Mónaco, personalidade que se considera ter motivado o príncipe herdeiro D. Carlos a seguir-lhe o exemplo.

Assim, D. Carlos I, em 1888, adquiriu um iate, em ferro e com três mastros, que nomeou de Amélia em homenagem à Rainha, sendo classificado como iate real. Em 1896, o Rei D. Carlos I decidiu utilizá-lo na sua primeira campanha oceanográfica. O iate Amélia, que para a História seria designado de primeiro de uma série de mais três que lhe sucederiam com o mesmo nome, foi então apetrechado com equipamentos com vista à realização de sondagens, dragagens e pesca.

Como classificar os navios de investigação?

Os navios de investigação podem ser classificados pela sua área de acção, e são divididos em 4 classes: LOCAIS, REGIONAIS, OCEANICOS E GLOBAIS.

>> Os navios de investigação locais possuem geralmente um tamanho entre 10 e 35 metros e têm geralmente um raio de acção reduzido, operando predominantemente em zonas costeiras e estuarinas.
>> Os navios de investigação regionais têm geralmente um tamanho entre 35 e 55 metros e operam predominante a uma escala regional, por exemplo, no Mediterrâneo ou no Mar do Norte.
>> Os navios de investigação oceânicos operam geralmente à escala oceânica o que quer dizer que operam num oceano, por exemplo no Atlântico ou no Pacífico. Estes navios têm tamanhos que variam entre os 55 e 65 metros.
>> Os navios de investigação global possuem um tamanho superior a 65 metros e podem operar a uma escala multi-oceânica.

navios de investigação ...sabias que?

Quantos navios de investigação existem na Europa?

Actualmente existem na Europa cerca de 265 navios de investigação activos, no entanto, nem todos estes navios se dedicam permanentemente à investigação, podendo ao longo do ano dedicar-se a outras actividades como pescas e transporte.

Os navios de investigação não se distribuem igualmente por toda Europa, ao lado encontra--se um gráfico que mostra a distribuição do número de navios pelos diferentes países Europeus.

NRP D Carlos I

Quais são os navios de investigação portugueses?

Em Portugal foram identificados 11 navios de investigação, dos quais 8 são locais, 1 é regional e 2 são globais.

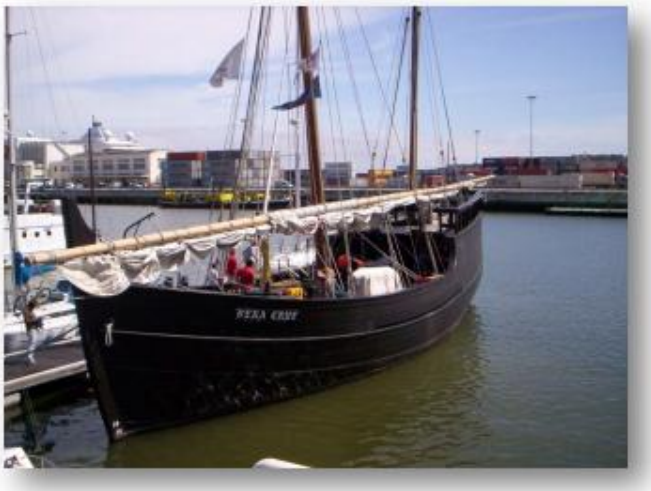
>> NAVIOS GLOBAIS: NRP D CARLOS I E NRP ALMIRANTE GAGO COUTINHO

O NRP D Carlos I e o seu irmão gémeo Almirante Gago Coutinho são navios hidrográficos da Marinha de Portugal. Foram construídos nos Estados Unidos em 1985, pelos estaleiros Tacoma Boat Company e foram batizados como USNS Assurance e USNS Audacious respectivamente. Faziam parte duma frota de 10 navios de vigilância e detecção anti-submarina, baseados cinco deles em Pearl Harbour e outros cinco em Little Creek (Virgínia), destinados à vigilância da frota submarina Soviética e colocados em pontos estratégicos das rotas dos submarinos Soviéticos.

Foram entregues a Portugal em 1997 e 1999 respectivamente, quando foram rebaptizados com a actual denominação. Neste momento estão atribuídos prioritariamente à execução dos levantamentos hidrográficos para a extensão da plataforma continental.

7.3. Educational quizzes'

Introdução à Investigação dos Oceanos e dos Fundos Marinhos
Ficha da Actividade



Identificação do Aluno

Nome: _____

Escola: _____

Turma: _____

ORGANIZAÇÃO:

COLABORADORES:

Esta saída no estuário do Tejo, a bordo da Caravela Vera Cruz, pretende ser uma actividade dinâmica e integradora, que te permite conhecer melhor alguns dos **Métodos utilizados para a Investigação dos Oceanos e dos Fundos Marinhos.**

Durante a campanha vais assistir à aquisição de dados de Reflexão Sísmica de alta resolução (*Chirp Sonar*), de Sonar de Varrimento Lateral, de correntometria e de sonda CTD (Conductivity, Temperature, Depth). Pretende-se igualmente que fiques a conhecer e compreender o funcionamento dos sistemas de posicionamento por GPS (Global Positioning System).

Não te esqueças de ouvir atentamente as indicações fornecidas pelos diferentes Professores e de fazeres as perguntas que entenderes de modo a poderes responder às perguntas que se encontram no guião e realizares o relatório que te será solicitado. Deves incluir-te num dos 3 grupos que realizarão tarefas rotativamente.

Atenção às notas de **segurança** que deves respeitar, porque u**ma embarcação é um local de risco** onde os comportamentos de segurança são fundamentais. Destes destacam-se:

a) **Utilizar obrigatoriamente** um **colete salva-vidas** durante a permanência a bordo.
b) **Nunca** tocar em nenhum equipamento **sem autorização prévia** de um dos professores responsáveis.
c) Não interferir nas actividades da tripulação.
d) Estar atento aonde se colocam os pés, evitando pisar os cabos que são muito importantes para as operações a bordo.
e) Descer ou subir escadas com muita atenção e não correr, para evitar cair ou magoar-se.

Aspectos principais focados durante a saída

I. Equipamento utilizado para investigar a geologia dos fundos marinhos e abaixo do fundo do mar.

Durante esta saída, vai ser utilizado um sistema Edgetech 512c, que combina um equipamento de Sonar de Varrimento Lateral com um Chirp-Sonar (sistema de reflexão sísmica de alta resolução).

1. Que tipo de informação te dá uma imagem de sonar de varrimento lateral?

2. Que tipo de informação te dá o Chirp-Sonar?

II. Importância de um posicionamento preciso dos dados geofísicos

GPS: Sistema de Posicionamento Global - sistema de posicionamento que nos dá as coordenadas de um lugar na Terra, desde que tenhamos um receptor de sinais de posição enviados por satélites em órbita da Terra. Pode ainda funcionar em modo diferencial, sistema DGPS, quando existe uma estação auxiliar fixa que envia correcções de erros de posicionamento via rádio. Neste caso, o sinal de GPS dá-nos uma precisão muito maior de posicionamento (inferior a 1 metro, por vezes centimétrica). Toma em atenção que, no caso desta actividade, o posicionamento é dinâmico, dado que a embarcação está em movimento.

III. Navegação

A velocidade de uma embarcação mede-se, geralmente, em Nós (1 nó = 1 milha náutica por hora; 1 milha náutica = 1,852 km). Sabendo que a velocidade média a que se desloca a Caravela nesta campanha é de 4 nós, converte essa velocidade em quilómetros por hora.

IV. Aquisição de dados de correntometria

1. Como se denomina um instrumento que mede as correntes?

2. Qual o princípio de funcionamento do instrumento utilizado a bordo da Caravela para medir correntes?

V. Aquisição de dados de temperatura e de salinidade da água

1. Como se denomina o instrumento utilizado a bordo para obter perfis de temperatura e de salinidade

2. Que tipo de sensor tem esse instrumento para medir a temperatura?

3. A salinidade é medida directamente ou indirectamente? Justifica a resposta.

VI. Aplicações deste tipo de estudos

Descreve algumas aplicações deste tipo de estudos.

VII. Caravela

1. O que definia a caravela latina e a distinguia das restantes embarcações?

2. Qual foi o "século de ouro" das caravelas portuguesas?

Comentários Finais

Coloca aos professores, à equipa científica de bordo e à tripulação as dúvidas que ainda não foram esclarecidas e outros assuntos que queiras saber relacionados com este tipo de trabalho.

7.4. EUROFLEETS canvas

7.5. Institutional Bags with project logo