

Hands-on Science Education Activities

**Challenges and Opportunities of Distant and Online
Teaching and Learning**

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The Hands-on Science Network



The Sea Starts Here. A Success Case in Sines (Portugal)

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Abstract. The campaign “The Sea Starts Here”, designed by “Eco-escolas”, is raising awareness on the impact of littering into road gutter (that might lead the litter into the sea), in order to prevent it. Sines municipally adapted the methodology and added an extra activity: cleaning the road gutters in the schools of Sines and its surroundings. So, several activities were carried out: workshops, cleaning of the road gutters, conception and design of the pictures in the classroom, plus draw and painting the design in the road gutters. The whole project was extraordinarily successful, and all the activities had clearly upbeat reactions from the students of the 7th year. The spoken feedback from the school community, was also incredibly positive.

Keywords. Marine Litter, Ocean, Pollution, Marine Literacy.

1. Introduction

1.1. Contextualization

The Sustainable Development Goals, adopted by all the United Nations Member States in 2015 [1], underscore the worldwide concern with the importance of ensuring sustainable production and consumption patterns, as well as achieving environmentally concerns on waste management throughout its entire cycle of life. In that regard, Environmental Education Projects (EE) that encourage the practice of “Rs” including prevention, reduction, reuse, recycling and separation at source, gain relevance.

As schools are privileged locations for raising environmental awareness, the “Environmental Education Program” (PEA) of the Sines Municipality, is focused on the adoption of practices that value and protect nature and the environment. In this assumption, promoting skills, attitudes and behaviors that

allow observing, questioning, evaluating and acting constructively in the natural environment, is the main challenge.

1.2. Road gutters – marine pollution

Marine litter, and especially the accumulation of plastic waste, has been identified as one of the biggest global problems of our time, causing a wide range of adverse impacts, such as ecological, aesthetic, economic and socio environmental.

In fact, nowadays the marine litter is out of hand, and many coastal countries are extremely alarmed about it. A study [2] mentioned that about 69% of the litter found in the shoreline of Chile, is mainly littering by beachgoers, or carried from streets, drains and gutters.

The problem of beaches pollution and marine environment contamination by plastics originating from road gutters, is mentioned since the last century (i.e., [3]).

Other important sources of coastal pollution are the cigarette butts. It is important that the messages in anti-cigarette-litter campaigns, emphasize that cigarette butts are not just litter but also toxic waste which can be very harmful if it is improperly disposed of [4], such as dropped on road or placed directly in the gutter.

1.3. Sines Municipality

The location of Sines city can be seen in figure 1. The municipality of Sines belongs to the district of Setúbal, has an extension of about 203.3 km² and includes two parishes: Sines and Porto Covo.

From the natural point of view, it is a privileged territory. To the south, it integrates the “Southwest Alentejo and Vicentine Coast Natural Park” (PNSACV) and, at its northern limit, the “Santo André and Sancha Lagoons Natural Reserve” (RNLSS), areas of the “Natura 2000 Network”, reserved for the conservation of important natural values of the fauna and flora.

Sines is a center of regional, national, and even global development, due to the dynamics introduced by the industry, supported by an important deep-water ocean port. In recent years, the city has grown very quickly, as a

result of the quality and size of its coastline.

However, the economic activities mentioned, also result in increased environmental pollution. The tourism, agriculture, and fishing sectors feel particularly threatened, and this has led to several manifestations of displeasure from the local community, over the years.



Figure 1. Location of Sines (adapted from google maps)

In this context, the various PEA of the municipality aims to continuously raise awareness, awakening eco-friendly habits and encourage a responsible and environmentally balanced behavior, in order to preserve and saving natural resources and the environment.

Addressing a set of themes and activities, with a focus on the waste theme, covering all the schools and levels, from pre-school to secondary education, is why the PEA presents itself as an important tool at the service of education. The objective is to provide the students with a set of critical knowledge and skills that allows them to act, directly and/or indirectly, in the construction of a better society and a cleaner and healthier environment.

1.4. Project Description “The Sea Starts Here”

The “The Sea Stars Here” is an international campaign, done in several cities and countries, namely in Barcelona (Spain) and Brighton (England), where a sensitizing phrase was inscribed near the road gutters as show in

figure 2.



Figure 2. Barcelona and Brighton. Source:

https://www.barcelona.cat/infobarcelona/en/tema/environment-and-sustainability/the-sea-starts-here-an-awareness-campaign-on-everyday-habits_1009375.html and [The-sea-starts-here-dont-litter.jpg](https://omarcomecaaquí.abae.pt/o-projeto/) (600×400) (brightonenergy.org.uk)

The “Blue Flag Association of Europe” (ABAE) and its Eco-Schools Program in Portugal launched the project “The Sea Starts Here” (<https://omarcomecaaquí.abae.pt/o-projeto/>) (Fig. 3).



Figure 3. Organizers of the campaign in Portugal

The realization of this project requires a strict cooperation between schools and municipalities.

The project has 3 phases:

- 1 - Preparation: Each school needs to present one drawing/image proposal that they intend to reproduce in the gutters/sinks. The prototype image should include the relationship between the drawing and gutters/sinks, to scale.
- 2 - Development: The entire process of implementing the paintings must be supervised by the City Council.
- 3 - Communication: The school is required to send a photograph of the paintings made, through the Eco-Schools platform.

In Sines, the "The Sea Begins Here" project is part of the PEA for schools (started in 2019-2020), with the aim of raising awareness on the consequences, both in terrestrial and marine ecosystems, of the incorrect disposal of waste.

1.5. Goals of this activity

Since "everything that is dropped on land ends up in the sea", the main goals are:

- Alert to issues related to incorrect waste disposal and sea pollution;
- Raise awareness of the need to preserve ecosystems and biodiversity in general, and the quality of fresh and salty water in particular;
- Educate for active citizenship by encouraging young people to pass the message that "everything that is dropped on land will end up at sea";
- Promote a campaign with impact on the community;
- Stimulate young people's creativity through the development of different skills, namely in the areas of cooperation and plastic expression (arts).

2. Methodology

Although it started following the original campaign, the environmental education team of the municipality, adapted the objectives and phases of the project. It was development during the school year of 2019/2020, but the painting of the road gutters was only done in 2021, because of the COVID19 pandemic.

The Sines municipally developed an innovative methodology (Fig. 4) in which the students participate actively in the cleaning of the road gutters, helping the professional employees of the city council.

To evaluated if the goals of these activities were achieved, a survey was done to the students that painted the road gutters. A random sample group of students was selected to inquire (not all the students, because of the concerns with COVID19).

This survey was done presencially, through a questionnaire with several itens:

- a) a group of questions to characterize the sample;
- b) the evaluation of several activities performed;
- c) the rates of the action.

A *Likert scale* [5] was used, rating from "not important" to "extremely important" and from "very bad" to "very good".

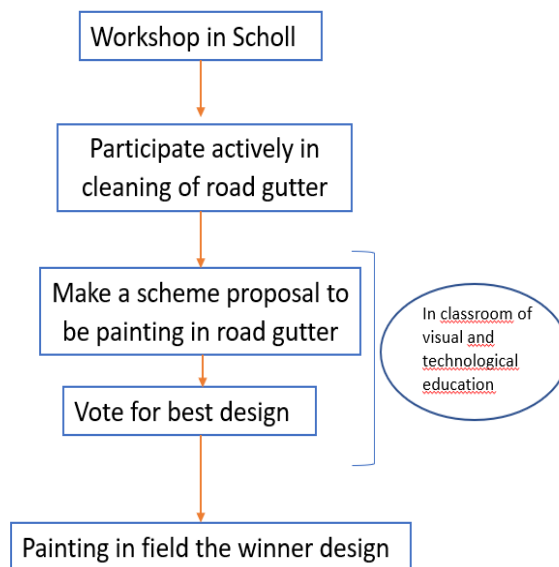


Figure 4. Methodology - sequences of activities

The survey was inserted in the program *LimeSurvey* and then exported to *Excel* where the tratament of the data was done.

3. Results and discussion

3.1. Students characterization

The students were aged between 15 and 18, with a mean of 16 years old, 89% male and 11% female. They were in the 7th grade at school, and, as it can noticed by their ages, some have failed some school year(s).

3.2. Importance of the theme

When questioned about the importance of the theme, almost 45% answered that its important, and none of the students disagree (Fig. 5).

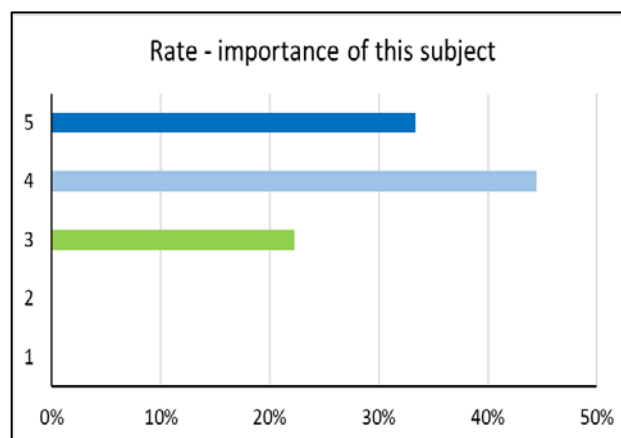


Figure 5. Evaluation made by the student about the importance of the theme. 1 is "not important" and 5 is "extremelly important"

3.3. Workshop

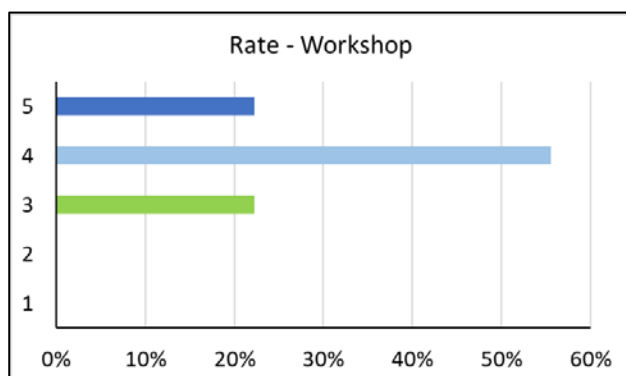


Figure 6. Evaluation made by the students about the workshop. 1 is “very bad” and 5 is “very good”

The initial workshop focused on:

- Explaining the problem of pollution and impacts of the marine litter in the ecosystems;
- The littering in the seawater that appears in the beaches;
- Raising awareness about plastic, cigarette butts, etc., and the years that they take to degrade in nature;
- Identify the origins of marine litter;
- Learning how one can contribute to reduce the litter;
- The impacts of litter in road gutter, being its final destiny the sea, rivers or lagoons;
- Some problems that the litter causes along the trophic chains, can affecting the biodiversity;
- Presenting the project and the activities scheduled.

The students evaluated this workshop positively, as can be seen in figure 6.

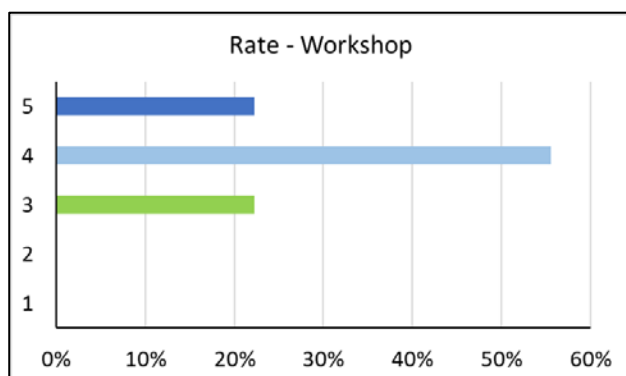


Figure 6. Evaluation made by the students about the workshop. 1 is “very bad” and 5 is “very good”

3.4. Cleaning of the road gutters

The participation of the the students in the cleaning of the road gutters, was done, as far as we know, only in Sines (see figure 7). When asked what they expect to find, 44% referred cigarette butts, 22% mentioned cockroaches and others spoke of different things like spiders, rocks, masks used to COVID19 protection, juice packages, plastics, paper, etc.

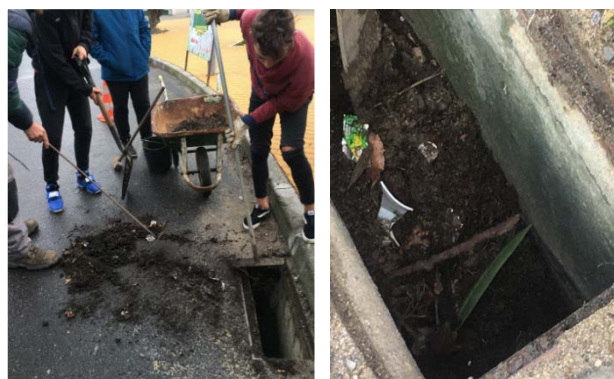


Figure 7. Activity of cleaning the road gutters

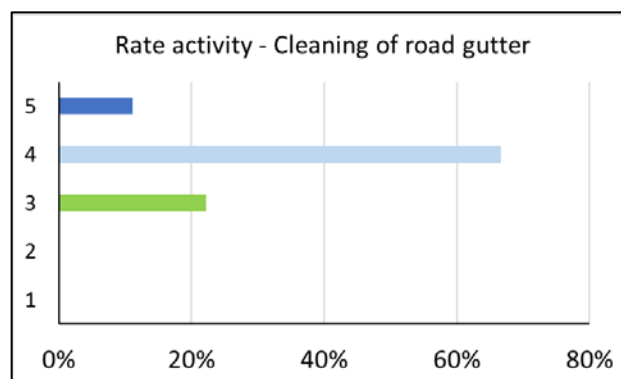


Figure 8. Evaluation of the activity – cleaning of the road gutters

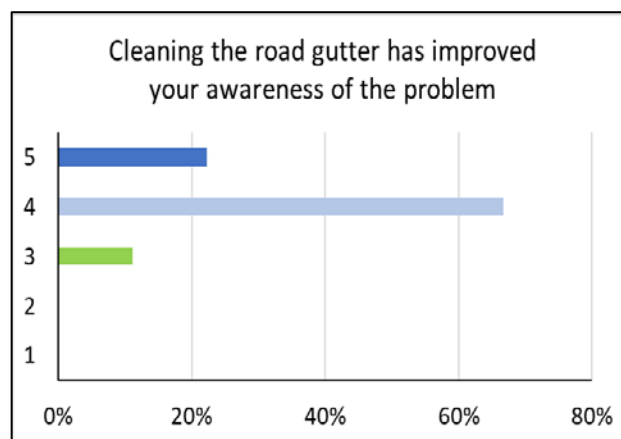


Figure 9. Evaluation about the improvement of awareness on problem

When asked if they expect to find what they ended up finding, 89% respond negatively and only 11% positively. This activity was well evaluated (Fig. 8) and improved their awareness on the problem (Fig. 9).

3.5. Scheme proposal made by the students

The students were asked about which colors they thought could better achieve the objective of visibility. They were given the possibility to chose more than one colour (Fig. 10).

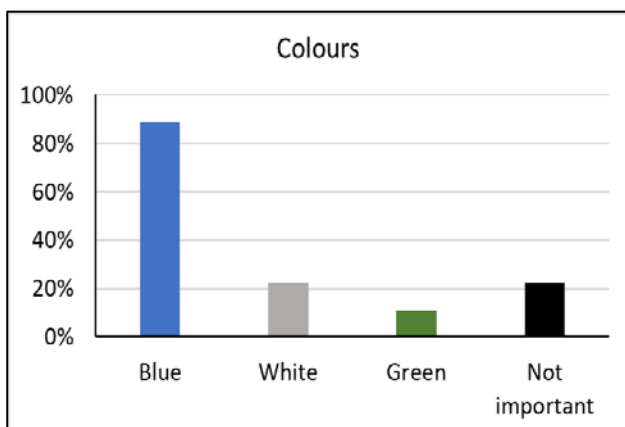


Figure 10. Colours that the students identify as best suited to paint the road gutters

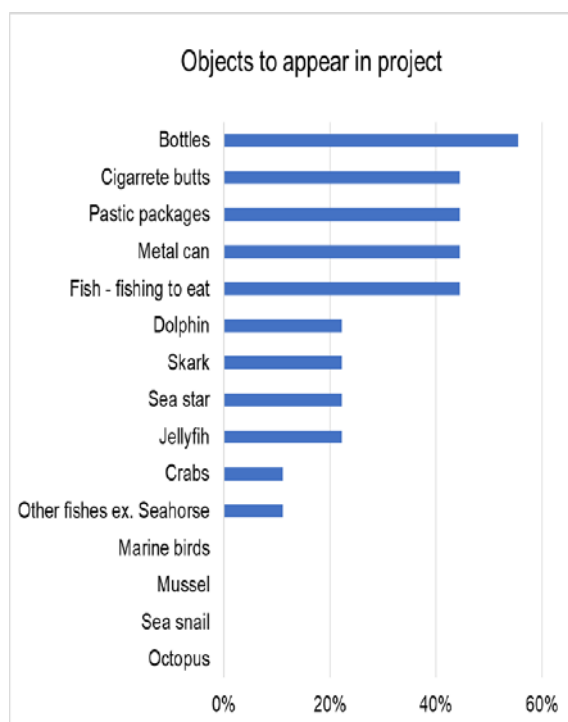


Figure 11. Images that students considered the most important to appear in the drawings, to arouse attention

The colour blue was chosen because it is normally identified with the sea and the colour white, as it reminds the sea foam. The green is the colour usually used in environmental activities, also being the “Eco-escolas” symbol (in Fig. 3). The drawings that students considered more relevant to arouse attention, represented litter objects, followed by images of marine animals (Fig. 11).

Concerning of what should be painted in the road gutters, the answers were not consistent with what was done in the end. In figure 12 it can be seen a drawing done by students during this phase. Concerning the significance of the key sentence “The Sea Starts Here” and the drawings, the opinions of students are diverse, as can be seen in figure 13.

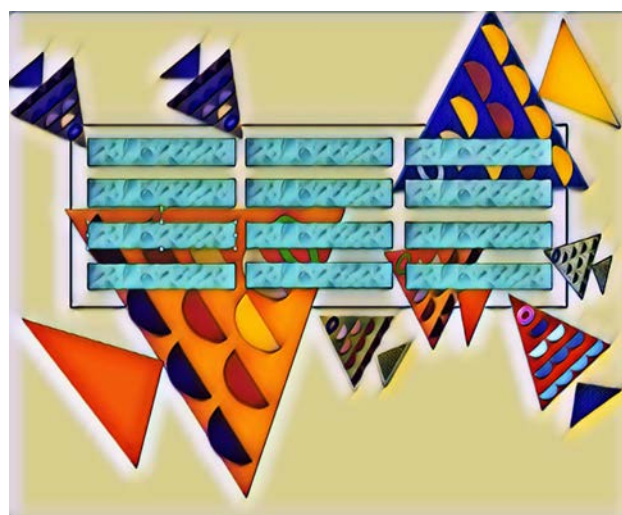


Figure 12. An example of what was done in the classroom in 2020

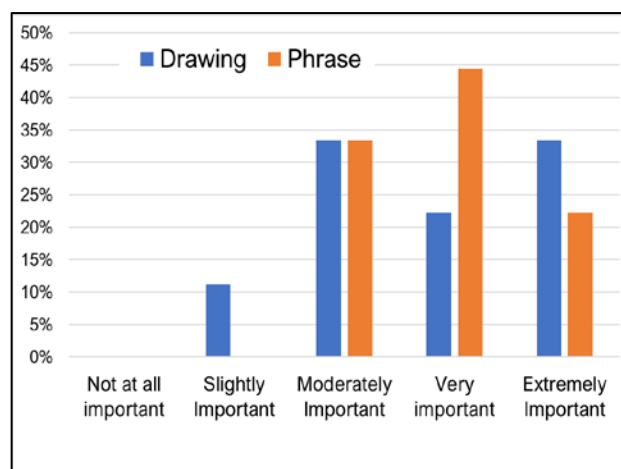


Figure 13. Significance of the key sentence and of the drawing to pass the message, according to the student's evaluation

3.6. Field painting

The winner projects were painted in the surrounding areas or including the road gutters, using special inks (not toxic), to avoid adding contaminants to the environment. In figure 14 the students are painting, and figure 15, shows the drawings after finished.

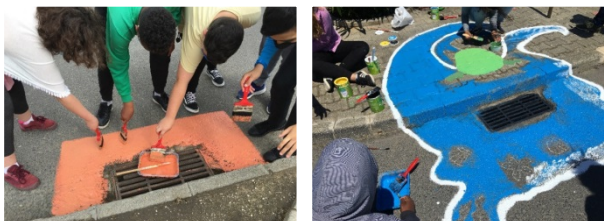


Figure 14. Students painting the road gutters in 2021



Figure 15. Final results of the paintings

4. Evaluation of the project

The student's evaluation of the project is positive (Fig. 16).

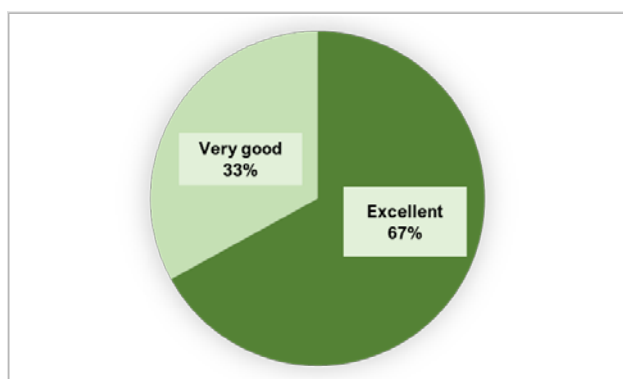


Figure 16. Evaluation of projects "The Sea Starts Here" by the participant students

In the survey, the following question was made: "Is there anything you would like to tell us?". There were some very nice answers, such as: "I think it's really cool because it's good for students to evolve" ("Eu acho muito fixe porque é bom para os alunos evoluirem"), and others to congratulate the staff.

The survey didn't have names, it was anonymous. Yet, some of the students wrote their names.

5. Conclusions

The students reacted very well, since this project included different actions and subjects (nature sciences, maths and arts). They seem to have understood the problem and be willing to change their behaviours.

Beyond the students and the school community, this project is relevant to raise awareness on the theme of marine litter, since any citizen that passes nearby the drawings in the road gutters, will see them. Also, the municipality received many questions and feedback about it, namely in the social media posts regarding the project, like in facebook.

Undoubtedly, this project constituted and will continue being an opportunity to address the problem, raise awareness on marine litter and increase marine literacy.

6. Acknowledgements

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