Hands-on Science
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Hands on Science: The Case Study of Pedra do Sal Interpretation Center

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Abstract. *Pedra do Sal Interpretation Center offers an original experience, and the possibility to observe and touch all of Avencas beach fauna and flora, once it is equipped with a touch tank, representative of a rocky shore tide pool. In 2013 the Municipality of Cascais developed and installed the permanent exhibition "Cascais, from Land to Sea" and adjusted all of its scholarly activities to this theme. Since the opening of the exhibition, the number of visitors of Pedra do Sal Interpretation Center has been increasing and is currently four times higher than in the past year (2012 vs 2013).*

Keywords. Cascais, coastal zone, hands on sea experiences.

1. Introduction

Environmental Interpretation Centres are of key importance to raise awareness, in both children and adults, for the environmental problems of the planet [2]. They make it possible to take a class outside the classroom, using didactic materials present in the centre [1].

In the early days, Environmental Interpretation Centres consisted only in static exhibitions with panels containing information on the natural values of the place where they were inserted.

With the evolving society it was clear that with this type of exhibition, the main goal of public environmental awareness for the visitors wasn't being achieved [3], therefore efforts were made to make the exhibition more appealing to adults, also including some children games to capture their attention.

With the technological revolution, the audiovisual systems are now a focal point in all of the Interpretation Centres enabling the visualization of films and documentaries that easily capture the audience attention.

In our days, the Environmental Interpretation Centres went from static exhibitions to fully interactive ones. The audiovisual means have evolved to enable virtual visits to the natural places, and the natural values were brought inside the centre itself, whenever this was possible.

In Cascais, the first Environmental Interpretation Center to be built was "Pedra do Sal" located at São Pedro do Estoril, in Cascais council (Fig. 1). This Center opened in 2005 with the main objective to raise awareness for the Biophysical Interest Zone of Avencas (ZIBA), a marine protected area located in a rocky beach nearby, however it *never had a permanent exhibition focused on the Ocean or the Coastal Zone.*

The Interpretation Center has innovative tools and exploration systems, which enhance the interaction between the visitor and the biophysical values present in the outdoor space, such as the geological formation that lead to its nomination as "Pedra do Sal".

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Figure 1. General view of the Environmental Interpretation Center

This Center began as an exhibition room and auditorium that hosted many temporary exhibitions, along with a permanent one dedicated to the natural values present on the outside of the centre. These natural values are visited through an interpretative pathway along the cliffs, passing by the Caparide stream (Fig. 2) and by a natural auditorium where outdoor classes can be attended (Fig. 3). The pathway ends at a coastal defensive spotlight and generator house which took part of an old coastal defensive construction.

Figure 2. Caparide Stream

In 2008 the Center was equipped with two fundamental pieces: a "Touch Tank" (Fig. 4) and a "Virtual Sightseeing" (Fig. 5). The "Touch Tank" is an aquarium that intends to replicate a tide pool with some of its animals and plants like see-urchins and sea stars. These animals can be touched by the visitors enabling the interaction with the species without going to the beach. The "Virtual Sightseeing" allows the visitor to access information about Cascais coast natural, landscape and cultural values, namely ZIBA, in a simple and intuitional way.

Figure 3. Natural Auditorium

Figure 4. Touch Tank

Finally in 2013, the Center was completely renovated and a permanent exhibition was

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installed, along with a small educational laboratory. The exhibition "Cascais, from Land to Sea" was developed in order to raise people's awareness about the Cascais coastal zone richness with a "hands on" methodology.

Figure 5. Virtual Sightseeing

With this paper we intend to analyze the visitors' response and evolution to the new dynamic of "Pedra do Sal" Interpretation Center.

2. Methods

The whole concept of the exhibition was to provide 4 spaces in a once opened space. A multitask space that can be adjusted to a children's area or to a conference area (Fig. 6); the exhibition space with 6 different stages and experimental boxes (Fig. 7); the auditorium for training classes; the laboratory for practical experiments (Fig. 8).

Figure 6. Multitask space, Children area or conference area

The exhibition guides the visitor from the physics of the ocean and functioning of the tides, to a trip in the geological history of Cascais coastal zone, passing between the tidal area of ZIBA and its underwater habitats. It also focuses on Caparide stream and its inhabitants. The exposition ends at

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an essential point, the explanation of sustainable fisheries and sustainable fish consumption. The key point of the whole exhibition are the experience boxes connected to each information panel, which were developed to suggest a practical activity related to each panel of information and that are changed every 6 month.

Figure 7. Exhibition space with 6 different stages and experimental boxes

The laboratory offers several water/ocean related experiments that the visitor can also perform, like water chemical tests that can be conducted in water samples from Caparide stream, otholit and scale visualization to determine the fish age, fish dissection and plankton observation.

For the scholar public there were also profound changes in the activities offered by the centre. All the activities are now adapted to the scholar curricula and the Center currently offers five different activities. All of these activities have a theoretical and practical (laboratorial) component, adjusted to the national scholar curriculum.

Figure 8. Didactical laboratory for practical experiments

The pre-school activities focuses on the water cycle, the primary school focuses on

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sustainable fisheries and ocean pollution, the preparatory school (normally 10 and 11 years old students) has the flora of the cliffs in the spotlight, the secondary school focuses on the physics of the light in the Ocean and the consequences to the net productivity. Finally, the high-school activities focuses on the sustainable consumption of fish and problems of overfishing. All of the referred activities have a theoretical introduction and a "hands on" experiment at the lab, which helps to understand the concepts presented in theory. Each student has the possibility to perform the practical activity and at the end a learning revision is conducted. Satisfaction questionnaires are performed to the teachers attending these activities.

Each day the total number of visitors is counted. Their age, nationality and how they learn about the exhibition is also recorded.

3. Results and Discussion

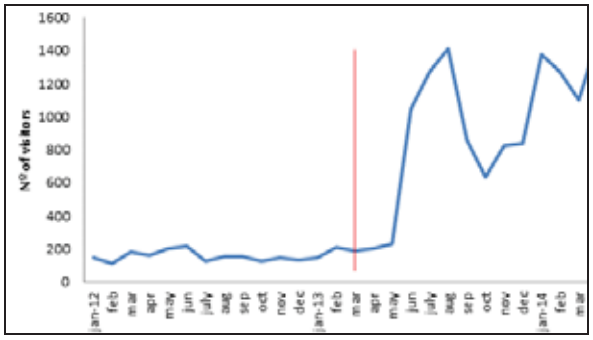

Figure 9. Number of visitors recorded in Pedra do Sal Interpretation Center

The new exhibit "Cascais from land to Sea" of Pedra do Sal Interpretation Center opened in March 2013 with a communication campaign associated with this inauguration. Since the opening, a total of 13 025 visitors were recorded, and the number of visitor in 2013 quadrupled when compared with the same period in 2012 (Fig. 9).

Most of the visitors are adults between (19 and 50 years old) from Cascais council; they come in family or as individual visitors. Most of the visitors knew the exhibit by friends or family that have already visited the Interpretation Center.

As for the scholar public, the activities were only changed in September 2013 and comparing to previous years a decrease noted in the number of school visits. However, the scholar year is not over yet and therefore there isn't enough data for a whole year of functioning.

The decrease of school visitors was due to the lack of free municipal transportation from schools to the Interpretation Center and not to a decrease in the school solicitations, once these were maintained throughout the scholar year.

The new contents of Pedra do Sal Interpretation Center brought a new philosophy to an old equipment attracting more visitors, and were able to fulfil the goal of providing marine environmental education to its visitors.

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