Chapter 6
Emblematic Coastal and Marine Environmental Education Projects in Brazil

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Abstract Aiming to briefly present and discuss examples of Coastal and Marine Environmental Education (CMEE) in Latin American Countries, six emblematic Brazilian projects were selected according to six different categories: (*a) Traditional Populations as social actors, represented by Tamarzinhos Project; (b) Charismatic Species, Golfinho Rotador Project; (c) Rocky shore Ecosystems, Underwater Marine Trail Project; (d) Simulacrum, Paraíba Marine Aquarium; (e) Marine Ecotourism Product, ProMar Project; and (f) Marine Sciences Courses in Public Schools, graduate Program in Marine Sciences applied to teaching.* Although these successful projects target at diversified publics and present different methodologies, their main objective is to promote changes in values, attitudes, behaviors, and postures to transform and emancipate people. The analysis of the projects allowed to conclude that: (a) they cannot count on medium and long-term financial support, but when they have funding it proved to be quite effective to propitiate good results; (b) the teams involved in the projects are not always multidisciplinary in face of their high-cost maintenance; (c) all projects present regular qualitative and/or quantitative evaluations; (d) the main difficulties were always related to financial support, and funding obtained from private sector has been the solution sought to face these difficulties. Despite all the difficulties found, the CMEE projects analyzed have been satisfactorily developed, mainly due to the commitment of their idealizers.

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6.1 Introduction

Although Coastal and Marine Environmental Education (CMEE) presents several possibilities in Latin American countries, Research in Environmental Education is a field that has not yet been explored in depth. The few initiatives come from Mexico and Brazil, where there is an attempt to institutionally promote educational research in the area. In other countries, the effort consists in carrying out research projects by a few researchers and some isolated institutions that, under precarious conditions, develop such investigations (González-Gaudiano and Lorenzetti 2009).

In addition, there is an important limitation related to the misconception about the own meaning of EE, which is quite common even among its promoters (Pedrini and De-Paula 2011) (see more on the definition of EE used here in Chap. 2). For example, in scientific popularization (SPop), EE is often treated erroneously (Hadel 2010), sometimes being used as a synonym for Environmental Interpretation (EI) or biology classes (Pedrini et al. 2010) and even, ecology or general science (Pedrini 2010). There are many examples of the confusion generated due to this lack of conceptual delimitation, as marine trails used in SPop projects being included in EE bibliographic databases or, on the other hand, projects aiming at the effective inclusion of EE in scuba diving briefings not always being considered as CMEE. Due to this situation, the retrieval of scientific papers from bibliographic databases, made by any reviewer on this subject, will certainly hamper, underestimating the subject and perpetuating serious mistakes that will be propagated in future inventories of EE projects, weakening initiatives on this subject.

Specifically, in Brazil, even though several efforts were made by governmental entities, there is a lack of a complete and reliable record and analysis of EE projects, consisting solely on inventories comprising specific periods of time or bibliographic units (BU), such as academic theses or dissertations (Reigota 2007). Due to the extremely diversified geographic and social contexts in the country, the "state-of-the-art" researches often resulted in partial and unstandardized analyses. More recently, the EArte project (2018) made available a database of Brazilian academic dissertations and theses on EE produced between 1981 and 2016, including 4205 documents, 11 of which having "marine" or "coastal" as keywords.

If we consider EE projects in Brazilian schools, an inventory was made by the Environmental Education Coordination Committee (EECC) of the Minister of Education and Culture (COEA 2001). Among 30 subject themes found in this survey, just sandbank/dunes, mangroves, and aquatic ecosystems were mentioned as CMEE and it seems that the related EE activities undertaken solely consisted of occasional or periodical short courses, beach cleaning, and planting campaigns. These kinds of EE activities pedagogically contradict those stated by Meadows (1989), and the recommendations stated by the National Environmental Education

Program (Brasil 2005—see more in Chap. 2). Also, there isn't a continuous evaluation of the projects under way (see more on evaluation in Chap. 5).

Although the great majority of EE initiatives in Brazil are short-termed, it is possible to identify some that present a sound theoretical basis and are persisting over time. This chapter aims to present six of these emblematic and successful Brazilian CMEE experiences, characterizing and describing them according to EE theoretical references, aiming to present some cues for the management of EE projects and furnishing some basis for the settlement of patterns to direct future initiatives.

6.2 Selection Criteria and Methodology for Data Gathering

The six emblematic projects were selected to explore a variety of contexts and approaches of CMEE along the Brazilian coast based on the following criteria: (a) Traditional Populations as social actors—here represented by Tamarzinhos Project, (b) Charismatic Species—here represented by Golfinho Rotador Project, (c) Rocky shore Ecosystems—here represented by the Underwater Marine Trail Project, (d) Simulacrum—here represented by the Paraíba Marine Aquarium, (e) Marine Ecotourism Product—here represented by ProMar Project, and (f) Marine Sciences Courses in Public Schools—here represented by the graduate (*lato sensu*) Program in Marine Sciences applied to teaching.

A clear and objective questionnaire was created aiming to gather information from the above specified projects. The questionnaire was sent by email to the coordinators of each project, to be filled by them or a person in charge. It was intended that each questionnaire would attain the required data to draw a clear and as complete as possible profile of each project. The first requested topic of the questionnaire was a brief historical description of the project, followed by the questions aiming to specify the following topics: (a) project maintainer institution and external financing source; (b) conceptual characteristics of the projects, including their target public, team composition, objectives, methods, evaluation strategies, and pedagogical products; (c) encountered difficulties; and (d) adopted solutions.

6.3 The Projects and Their Institutional Financing

The selected projects showed a great diversity of maintainer institutions (Table 6.1). There were federal agencies such as Chico Mendes Biodiversity Institute (ICMBio) and the Federal Institute of Santa Catarina (IFSC) or state institutions as the State University of São Paulo (USP). Paraíba Aquarium was maintained by private companies, while the Tamarzinhos Project relied on the sponsorship and sustainability strategy through the Pro-Tamar Foundation.

Table 6.1 Characteristics of the selected projects according to their typological classification, maintainers, and bibliographical references that detail the project

Typology	Project	Maintainer institution	Reference
Traditional Populations as social actors	Tamarzinhos Project	Pro-Tamar Foundation	Silva et al. (2015)
Charismatic Species	Golfinho Rotador Project	Chico Mendes Biodiversity Institute (ICMBio)	Silva Junior et al. (2010)
Rocky shore Ecosystems	Underwater Marine Trail Project	University of São Paulo Biosciences Institute (IB-USP)	Berchez et al. (2005)
Simulacrum	Paraíba Aquarium	Paraíba Aquarium	Aquário Paraíba (2018)
Marine Ecotourism Products	ProMar project	Nongovernmental Organization ProMar	Rhormens et al. (2017)
Marine Sciences Courses in Public Schools	Graduate Program in Marine Sciences applied to teaching	Federal Institute of Santa Catarina (IFSC)	Berchez et al. (2016)

6.3.1 Tamarzinhos Project

Tamarzinhos Project is a Marine Environmental Education course that promotes ocean literacy (see Chap. 1) associated with marine conservation among children, being developed at the Tartarugas Marinhas Project (TAMAR; Marine Turtle Project) based at Praia do Forte (Bahia State) and lasting one year. It seeks to understand the perception that these children have about the environment in which they live, using Marine Turtles (Fig. 6.1) as a guiding element in the activities focused on the affirmative view of local culture, environmentally sustainable practices, and preservation of the various surrounding ecosystems. It was created in 1996 and has been evolving since then. Each edition includes a group of 20 children of the local community, from 10 to 14 years old, selected by the criteria of being enrolled at a school, having territorial ties with the locality and being residents from Praia do Forte surrounding communities (Pegas et al. 2012).

6.3.2 Golfinho Rotador Project

The Golfinho Rotador (Spinner Dolphin) Project was created in 1990 aiming at the conservation of marine biodiversity, using the charisma of dolphins and the ease of presenting ocean wildlife at Fernando de Noronha (FN) island, a marine protected area in Northeastern Brazil. It acts by empowering, raising awareness and sensitizing entrepreneurs, service providers, students, public agents, and tourists to adopt

Fig. 6.1 Children attending an activity from Tamarzinhos Project, Bahia State, Brazil. Photo by: Valeria R. F. Silva

sustainable practices in their daily lives. It was sponsored by its own coordinators and by the Brazilian public oil company. The project coordinator participate in the implementation of four national action conservation plans and also in the process of evaluating the conservation state and the network of stranded aquatic mammals in Brazil, in addition to the formulation of local public policies through the FN advisory councils, contributing to develop a broad research program for the conservation of cetaceans.

6.3.3 Underwater Marine Trail Project

The Underwater Marine Trail Project started in 2001 at Ilha Anchieta State Park, a marine protected area in São Paulo State, and since then models of activities with a standardized conceptual basis have been developed, such as a snorkeling trail, a SCUBA diving trail, a tide pool visitation, a kayaking route in the mangroves, a terrestrial trail, and, finally, in 2006, a theoretical trail, constituted of interactive posters (Fig. 6.2). The project was envisioned with the objectives of: (1) developing, applying, and testing, through research projects, environmental education standardized models, in search for standards for CMEE activities, aiming to contribute to structuring similar projects in other locations; and (2) transforming and favoring the participants in knowledge, affectivity, and capacities, promoting a change of expectations and world view, and awakening them to recreational and professional activities related to the marine environment and the importance of their ecosystems.

Fig. 6.2 Snorkeling and SCUBA trails of the Underwater Marine Trail Project, São Paulo State. Photo by: Alexandre de G. Pedrini

Fig. 6.3 Marine interpretive trail of ProMar project. Photo by: Marta S. Rhormens

6.3.4 ProMar Project

The ProMar Project developed a model of marine ecotourism in a reef ecosystem at the Environmental Protection Area of Tinharé and Boipeba, a coastal protected area on the northeast coast of Brazil, which presents excellent conditions for the implementation of ecotourism products such as marine interpretative trails (Fig. 6.3). A 320-m-long trail was installed at Tassimirim beach, which presents

diversified marine reefs. Implementation methodology was based on seven steps, starting with community mobilization. By this method, local traditional people were trained as conductors to offer an effective marine ecotourism product to tourists. About 89% of the participants who tested the product evaluated it as "excellent"; 76% of participants would accept to pay $17.00–$33.00 for the product; and more than 79% of the local residents and entrepreneurs found the initiative excellent. The product was tested for 10 days and generated a total income of US$ 433.00. It was concluded that the CMEE product showed efficacy and economic/environmental sustainability. It was well accepted by local entrepreneurs, ecotourists, and community.

6.3.5 Paraíba Aquarium Project

The Paraíba Aquarium (PA) was opened to the public in 2016. It relies on partnerships with universities, public agencies, nongovernmental organizations, and associations for the implementation of research, information exchange, and other activities related to marine conservation. Since its inauguration, the PA received 48,000 visitors, mainly families, surrounding community, educational institutions, researchers, scout groups, elderly groups, and disabled persons' groups. It develops environmental events and assisted programs (Fig. 6.4), through sensorial activities, lectures, dynamics, and environmental education and nature interpretation techniques, such as the actions "Unraveling the Marine creatures," "Young Investigator," and "Young handler." It promotes outdoor activities at the Seixas Beach Natural tide

Fig. 6.4 Students interacting with a shark tank. Photo by: Paraíba Aquarium

Pools by aims of a Snorkeling Marine Trail and a Coastal Walking Trail (through the interpretation of the coastal landscape at Seixas beach). It provides infrastructure, equipment, and technical information for graduate projects and undergraduate students.

6.3.6 IFSC Graduate Course in Marine Sciences Applied to Teaching

The graduate course in Marine Sciences Applied to Teaching has been offered since 2014 by the Federal Institute of Santa Catarina (IFSC) , at Itajaí campus. Its team is multidisciplinary, composed of fifteen teachers and administrative technicians in education from several areas of knowledge. The target public of the course is composed of teachers and managers of basic education from all educational areas (Fig. 6.5). The main objective of the course is to promote ocean literacy (see Chap. 1). The structuring axis of the course is to promote the implementation of integrative and interdisciplinary educational practices related to the marine environment in schools and scholar curriculum. The course comprises 400 h in which students develop knowledge related to marine biology, oceanography, meteorology, coastal management, environmental legislation, fundamentals of socioeconomic activities related to the marine environment such as fishing, aquaculture, and nautical principles, and disciplines related to pedagogical area.

Fig. 6.5 Field survey of the students of the graduate course in Marine Sciences Applied to Teaching of the Federal Institute of Santa Catarina (IFSC). Photo by: Benjamin Teixeira

6.4 Projects' Conceptual Characteristics

The conceptual characteristics of the projects were analyzed following the general guidelines stated by the National Program of Environmental Education-ProNEA (Brasil 2005), which adopts the Environmental Education model for Sustainable Societies and Global Responsibility (EESS). This approach was used in the works of Berchez et al. (2007, 2016), Pedrini et al. (2016), and Rhormens et al. (2017). According to these authors, the conceptual characteristics of EESS aim to change behaviors and emancipation from the individual to the whole community, being as follows: (a) transformative: facilitates changes in attitudes for the development of sustainable societies, (b) participative: encourages participation in collective mobilization, (c) embracing: involves all the various social groups, (d) permanent: performed as a continuous activity (or continued EE), (e) globalizing: acts directly on the reality of the activity and on achieving global dimensions, (f) ethical: respect for human beings and all life-forms, (g) interdisciplinary: integrates various forms of knowledge, (h) holistic: aims at transforming the individual as a whole, e.g., values and ethical concepts, (i) multiplying: aims at expanding activities through the formation of multipliers, (j) contextualized: considers the local social, geographical, and biological diversity in the projects (Table 6.2).

6.4.1 The Target Public

The analyzed projects target mainly on an audience composed of students of different levels, children and teenagers in the majority, but also teachers, school managers, tourists, and residents of the region where the project is carried out.

6.4.2 The staff

The composition of the teams of almost all the projects analyzed was not multidisciplinary, except for the Graduate Course in Marine Sciences Applied to Teaching of the IFSC due to the expertise and diversity of the specialists involved. This assumption is one of the most fundamental of EE, since each socioenvironmental issue to be addressed demands a specific multidisciplinary team. Berchez et al. (2007, 2016) and Pedrini and De-Paula (2011) point out that to obtain interdisciplinary a multidisciplinary team would be required.

Table 6.2 General results of the analysis of the conceptual characteristics of Environmental Education for Sustainable Societies in the selected projects

Conceptual characteristics	General results
Transforming	The actions implemented, in general, aim to enlighten conscious citizens about their local reality and worldview. Their goal is to promote a change of individual and collective attitudes, mainly related to tourism and its disconnection from their local reality as of the global ecosystem. All projects analyzed focus on the empowerment of coastal communities, the rescue of their traditional way of life. Specifically, the ProMar Project aims at the financial emancipation of the traditional people as microentrepreneurs
Embracing	The activities of most projects contemplate local social actors involved with a socioenvironmental problem, such as local community, students, teachers, businessmen, service providers, public officers, family, tourists, etc
Permanent	Although this is the most important and difficult feature to be put into practice, as it depends on funding, all the studied projects have shown continuous activities, some with more than 20 years of existence such as the Golfinho Rotador Project and Tamar, as they receive external sponsorship
Globalized	The analyzed projects address local problems and their connection with global threats such as disorientated tourism, and loss of biodiversity, among other problems in coastal areas, thereby promoting ocean literacy
Interdisciplinary	Interdisciplinary approach was present in all analyzed projects, but the financial means to hire a multidisciplinary team is still a problem. However, in some projects, there are professionals from several areas, as in the IFSC graduate course in Marine Sciences Applied to Teaching
Contextualized	All projects adopt an approach that contemplates the local social, biological, and geographic diversity in their pedagogical activities
Multiplying	Although all projects intend to train multiplier agents, some projects are dedicated to offering training courses to teachers from coastal schools. The involvement of all projects with local community schools allows the formation of multipliers of the activities. In addition, we can mention the training of ecotourism guides/conductors in the ProMar and Underwater Marine Trail projects
Holistic	All projects are structured around the axis of marine biodiversity, coastal and marine ecosystems, and their conservation with an integrative focus on changing of attitudes and values, thus avoiding an anthropocentric approach

6.4.3 Objectives

The objectives of the analyzed CMEE projects are related to their specific audiences, mainly tourists, and traditional communities, along the shore or in oceanic islands where they operate. Therefore, their goals vary. However, in all of them, CMEE could be identified as an instrument to cope with the rapid and negative socioenvironmental transformations. The actions aim to raise awareness, and educate, transform, and empower citizens and their community to mitigate the current socioenvironmental problems as well as to prevent future ones, ensuring sustainability of coastal and marine ecosystems and their social, geographical, and biological diversity.

6.4.4 The Methodological Approaches

Analyzing the methodological approach of the projects, it was possible to notice that they use different strategies, among which we can perceive two crucial points.

The first point is related to the appropriate formation and training of the team. At first, it's perceived in two different ways of running the whole processes related to the project (from elaboration, team formation, implementation, and maintenance): (a) dialogical bottom-up process, by aims of public opinion survey, meetings, and group deliberations, bringing together people from the region, as in the case of ProMar project; and (b) external model of project, in a top-down process, with little or no participation of local communities in decisions, gathering specific selected persons for the team, as in the case of the IFSC or Paraíba Aquarium.

The second point is related to the way of approaching the public. Great amounts of methodological strategies were found, from theoretical classes to practical activities in which ludic strategies are used in classrooms or outdoors. In short, methods can be based on indirect contact, such as the visualization of organisms in captivity or in the wild; or direct contact, as touching and cherishing marine organisms, mainly invertebrates, such as sea stars, and rays in touch tanks, such as also charismatic species like dolphins or sea turtles in captivity or in the wild.

We highlight the methods based in the direct exposure of the public to the ecosystem through underwater or terrestrial trails mediated by guides or monitors. By this method, the public is literally immersed in the visited environment visualizing organisms and the natural features of reefs, mangroves, beaches, and rocky shores. Among methodological strategies adopted, related to the interpersonal relationships, we must mention briefings, informal group conversation, interviews, questionnaires, video projections, lectures, theatrical plays, games, and simulations, all of them accompanied by debates or not. Unfortunately, we should remark the fact that many of these strategies are poorly adopted despite their high potential to sensitize and bring awareness to the target public.

It was noticed that the methodologies favor the ludic contact with the marine and coastal environment, which is in accordance with the assumptions of Berchez et al. (2007), Ghilardi and Berchez (2010), Pedrini and Saito (2014) and Pedrini et al. (2011, 2014, 2016). The objectives of these actions are focused on the construction of values, transformation of attitudes, and social emancipation, according to Quintas (2004), Berchez et al. (2016), and Rhormens et al. (2017), as seen in the premises of the Treaty on Environmental Education for Sustainable Societies and Global Responsibility (TEESS) (see more about TEESS in Chap. 2).

6.4.5 Efficacy Evaluation

Evaluative processes are eminently qualitative. They vary widely, according to the appraiser. Therefore, it is difficult to scale and compare projects. Only the Tamarzinhos Project or those projects which are linked to universities, such as

ProMar and Underwater Marine Trail Project, use quantitative assessments, enabling comparisons. All projects use some type of qualitative evaluation instrument or technique, such as questionnaires, interviews, personal reports, observation, recording behavioral displays, analysis of drawings, or informal group conversation (see more on evaluation in Chap. 5).

6.4.6 Pedagogical Products

As expected, the pedagogical activities vary greatly according to the available budget. The ones performed by small-scale projects generally require the acquisition and production of low-cost materials such as photo cards, e-book with simple presentations, posters, handmade games, black and white leaflets, simple field guides, as well as the promotion of local events. On the other hand, the projects with external financing have more expensive and sophisticated products such as elaborated field manuals, printed books, dynamic e-books, documentaries, plot movies performed by professionals, puppet theater, video games, clothes, bags, caps, various kinds of souvenirs, and customized materials and they also promote events of wide scope (see more on instructional materials in Chap. 8). However, greater effectiveness of activities cannot always be attributed to greater availability of material resources, as noticed for ProMar project and other community-based projects (Rhormens et al. 2017).

6.5 Difficulties

The main difficulty is the medium- and long-term financial sustainability of the projects, besides the maintenance of infrastructure and the impossibility of expansion to meet the growing demands of the public and the projects itself. The lack of governmental support is also a hindrance.

All analyzed projects count or have already counted on the support of some entity or institution to which they are linked, although financing is always problematic for the projects developed by public universities. Simple or community-based projects, such as Underwater Marine Trail and ProMar, have limited funds, but they thrive in meeting their goals. On the other hand, projects motivated by charismatic/flag species receive large sponsorships, as in the case of Tamar and the Golfinho Rotador, producing abundant publicity material and attending a target public of greater income. In fact, as Berchez et al. (2007, 2016), Pedrini et al. (2016), and Rhormens et al. (2017) stated, one of the important assumptions of transformative and emancipatory EE is its financial sustainability.

Another difficulty not linked to the sustainability of the projects, but of much importance, is the difficulty in achieving longer contact time and subsequent follow-up of the target public as seen in some projects, making it difficult to assess the efficacy of the activities. This occurs mainly in the case of tourists in marine or

coastal protected areas, which make up the target public of Golfinho Rotador, ProMar, Tamar, and Underwater Marine Trail projects. In these projects, there is brief contact with the target public in short-term pedagogical activities, which makes it difficult to evaluate pedagogical effectiveness through pre-/posttests.

6.6 Solutions

The best way to ensure the sustainability of projects has been seeking financial support in medium- and long-term sponsorship programs at private or public corporations. This is the case of the Brazilian oil company, which has been financing the Tamar and Golfinho Rotador projects for decades. In the case of other projects, the financing is obtained from the federal and regional agencies and foundations for the support of researches, many times in the form of scholarships and daily or subsistence allowances. In the case of the graduate course in Marine Sciences Applied to Teaching of the IFSC, there is full funding obtained from the federal government and in the case of Paraíba Aquarium the financing comes in the form of the income obtained with the collection of tickets.

Obviously, the main consequence of the abovementioned financial support will be the training of qualified personnel, the acquisition of necessary resources and the possibility of producing efficient pedagogical materials and practices for the modification and consolidation of concepts about the environment by the target audiences of the projects.

In relation to the evaluation of the public, for now, only the projects leading with traditional communities are based on long-term activities and continuous contact, making it possible to evaluate the expected results, such as changes in attitudes. It is necessary to plan a strategy of long-term evaluation for the others that deal with different publics.

6.7 Conclusions

The projects analyzed in the present chapter can be considered well succeeded, but several projects like them face many difficulties to persist existing. We consider that a broad registration of all CMEE projects in Brazil is essential, considering not only their characterization but also their related bibliographic production, aiming the production of essential knowledge for the future development of CMEE in Brazil.

To make the CMEE's efforts more effective in Brazil, a greater articulation between the projects is needed, bringing integration and visibility to the CMEE, aiming its insertion in elementary and high school educational systems. In Brazil, there is still no guideline document with an exclusive focus on issues related to marine and coastal environments pedagogy. In this sense, it is urgent to rethink the basic educational curriculum in the light of marine sciences and CMEE aiming to promote effective ocean literacy.

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