Article

A University-Hosted Program in Pursuit of Coastal Sustainability: The Case of Tokyo Bay

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Abstract: This study presents a unique way by which a university program can contribute to capacity development for coastal sustainability. The program is steered by a working group of volunteer faculty members, having different academic backgrounds, in collaboration with students and marine professionals, including fisherfolk and environment education interpreters. Although the program began with conventional educational ideas and style, its practical framework evolved to include interactive activities with collaborators in the community, all of which were geared toward social learning. The combination of service learning and participatory action research (PAR) was proven to be an adequate approach to link higher education for sustainable development (HESD) and university-community partnerships and to promote learning for coastal sustainability. Challenges identified include (1) ensuring continuity of learning and (2) reducing the heavy workload of faculty members involved in program preparation and coordination. The authors would like to emphasize the possibilities offered by the engagement of scholarship in the capacity development for coastal sustainability by focusing on community-based efforts.

1. Introduction

The sustainable use of the coast is one of the challenges faced by humans. Since ancient times, people have gathered, built settlements, and developed cities along coasts, particularly estuaries and tidal flats, because they were attracted to the diverse ecosystem services offered by such coasts. This population concentration has, however, led to the degradation of coastal ecosystem services around the world, causing various problems, such as resource depletion, water pollution, deterioration of biodiversity, natural disasters, rising sea levels, beach erosion, and conflicts over land and resource use [1].

To ensure sustainability of the coast, integrated coastal zone management (ICM) was developed as the primary means [2]. High expectations have been placed on ICM "to unite government and the community, science and management, as well as sectoral and public interests in order to prepare and implement an integrated plan for the protection and development of coastal ecosystems and resources" [3]. As Agenda 21, an action plan adopted by the United Nations Conference on Environment and Development (Earth Summit), held in 1992, stated that coastal states should commit themselves to the integrated management and sustainable development of coastal areas and the marine environment under their respective national jurisdictions [4], ICM has become an international requirement. The promotion of ICM as well as the need for its capacity development was re-endorsed by many international initiatives for sustainability, including the Convention on Biological Diversity [5] and the World Summit on Sustainable Development in 2002 [6]. The definition of capacity development by the Working Group on Capacity Development for Global Forum on Oceans, Coasts, and Islands [7], which is "empowering people to understand and resolve issues associated with managing resources and to maximize opportunities towards a better livelihood", is adopted in this study.

The purpose of this study is to present a way by which universities can contribute to capacity development for sustainable coastal governance, through activities undertaken by the Edomae Education for Sustainable Development (ESD) program of Tokyo University of Marine Science and Technology (TUMSAT), by means of combining higher education and university-community partnerships. TUMSAT is the only maritime university in Japan and its mission is "to carry out basic and applied educational and research activities related to studies as well as the science and technology of oceans, with a view to contributing to the sustainable development of the human society" [8]. The Edomae ESD program is an experimental effort by volunteer faculty members of TUMSAT, the objective of which is to collaborate with the community in an effort to encourage discussions on the sustainable use of the coast, mainly of Edomae or the innermost reaches of Tokyo Bay. As the program is intended to realize the scholarship of engagement, and the basic concept of the activities rooted in higher education for sustainable development (HESD), those two concepts are adopted as the framework of this study.

2. Conceptual Framework

2.1. The Scholarship of Engagement

Boyer (1996) [9] described a university's community involvement as "the scholarship of engagement". With that term, he primarily meant connecting the vast resources of the university to the society. He further extended the concept to suggest a reciprocal, collaborative relationship of scholarship with a public entity that consists of (1) research, teaching, integration, and application scholarships that

(2) incorporate the reciprocal practices of civic engagement into the production of knowledge [10]. Such kinds of civic engagement mean more than the transfer of knowledge from universities to the public through outreach activities; they refer to social dynamic concepts, including the learning community, collective intelligence, and knowledge generation [11–13].

The scholarship of engagement has emerged in many forms, including public scholarships, participatory action research (PAR), community partnerships, public information networks, and civic literacy scholarships [10], or more simply, community service, service learning, and community-based research [14]. If the focus is on students, service learning is a powerful means of increasing students' civic engagement [15,16]. Service learning is a "course-based, credit-bearing educational experience in which students participate in an organized service activity that meets identified community needs, and reflect on the service activity in such a way as to gain further understanding of the course content, a broader appreciation of the discipline, and an enhanced sense of civic responsibility" [17]. Service learning has, however, been criticized for its lack of social change orientation on the basis of collaborations with community organizations [18], and it can benefit both the community and the academe only if each party learns from the other and from the experience [19]. PAR, on the other hand, is a more community-oriented approach in response to a community's problems. PAR involves the people or organizations being researched as participants in the research process and sometimes, even the group of people who may benefit from better information about the situation at hand are included [20–22]. A variety of PAR models have been introduced and four characteristics are commonly found: PAR is cyclic, participative, qualitative, and reflective [23].

2.2. Universities' Roles in Education for Sustainable Development (ESD)

We are now at the final stage of the United Nations' Decade of Education for Sustainable Development (DESD), which spans from 2005 to 2014 [24]. ESD embeds key sustainable development issues into teaching and learning, requires participatory teaching and learning methods that motivate and empower learners to change their behavior and take action for sustainable development, and consequently promotes competencies, such as critical thinking, imagining future scenarios, and making decisions, in a collaborative way [25]. ESD can be seen as an education in citizenship, a responsive social learning process [26].

Although ESD can take place in many forms and at any educational level, universities and other institutions of higher education, among others, are expected to take the initiative in promoting ESD. At the start of DESD, universities were expected to contribute to sustainable development (SD) mainly in two ways: by giving SD a place in all university curricula and educational and research programs, and by playing a key role as local SD knowledge centers [27]. In line with the call for promoting DESD in higher education, some university programs placed their emphasis on active learning and development of skills to solve problems that students would face in the real world [28–30]. The university's role in regional sustainability, on the other hand, includes educating citizens to foster volunteers who can contribute to developing sustainability in local communities [31] and developing partnerships for SD initiatives between universities and other local stakeholders [32], which have been manifested by efforts to set up Regional Centers of Expertise on ESD around the world [33,34]. Although not explicitly stated, those activities overlap with the engagement of scholarship.

Despite the high expectations placed on institutions of higher education, however, recent research shows that education and research on sustainability in universities is still in its infancy [35,36] and the roles of academia in promoting regional sustainability are limited [37]. Barriers include the lack of understanding of the concept of SD, low awareness, unclear vision and objectives, and the lack of commitment [38]. In addition, in academia, teaching and research are preferred because working with regional stakeholders receives low priority and yields limited academic rewards [39]. The high dependence on government policies and funding is another concern regarding the sustainability of HESD activities [40,41].

2.3. Purpose: Scholarship of Engagement for Coastal Sustainability

In the context of ICM and in line with the directions of ESD, universities are considered to have two possible ways of contributing to capacity development for coastal sustainability. The traditional, primary role is to use their curricula to educate and develop practical coastal professionals who have knowledge of coastal resources and environments and the skills to prevent, manage, and solve problems that occur there. This type of contribution was well discussed and framed a decade ago [42–44] and practices were reported [45].

The other social responsibility that universities are expected to bear is to serve as a knowledge base for communities in support of coastal resource use and conservation. A prevailing example of such programs is NOAA's National Sea Grant College Program of the United States, which is positioned in the country's legal system and whose mission is "to provide integrated research, communication, education, extension, and legal programs to coastal communities, which would lead to responsible use of the nation's ocean, coastal, and Great Lakes resources through informed personal, policy, and management decisions" [46]. The Sea Grant College Program is, however, adopted by only a few nations and literature on university-community partnerships for costal sustainability is limited despite emphasis given to the need for networking among stakeholders at the early stage of ICM promotion [47,48]. Fletcher (2008) [49], in his paper on the role of universities in supporting ICM in the UK, stated that the difficulties to be involved for individual academics included that contributing to management practice may not be aligned to the mission of the universities. Those difficulties are similar to the barriers to enhancing the contribution of universities to the promotion of ESD in other disciplines.

How then can universities contribute to capacity development for costal sustainability without having to depend on the nation's political and financial support, while fulfilling their mission to pursue higher education and scientific research? The purpose of this study is to present such an independent, community-based way through activities undertaken by the Edomae ESD program of TUMSAT. The Edomae ESD program is volunteer-based and therefore informal, and its activities are supported by volunteer faculty members of TUMSAT and collaborators outside campus. The program objective, *i.e.*, promoting discussions on the sustainable use of Tokyo Bay, is based on the presumption that stakeholder participation is important to achieve equity, efficiency, and effectiveness of and compliance to coastal governance [50]. Unlike other HESD programs of Japanese universities, which were launched with strong initiatives and abundant funding from the Ministry of Education, Culture, Sports, Science, and Technology, the Edomae ESD program was established in response to the call of the Ministry of Environment for local ESD projects across the country in an effort to promote DESD in

the fiscal years of 2006–2007. Although the program is organizationally independent from the university, the university recognizes the program's activities as part of its outreach activities and grants the program certain benefits, including the use of university classrooms and equipment. The authors would like to present the program as a collection of independent approaches of the engagement of scholarship in the capacity development for coastal sustainability.

3. Background: Challenges Faced by Tokyo Bay

3.1. Environmental Issues

Tokyo Bay is one of the most heavily used enclosed urban waters in the world, and the greater Tokyo metropolitan area within the watershed has a population of over 29 million. Tokyo Bay was called "Edomae no Umi" (Coast of Edo) in the Edo period (1603–1867). Since the foundation of the Government of Edo, the bay has been supporting the lives of the huge populace with its ecosystem services, such as seafood provisioning, climate regulating, and cultural services.

The present major concern of Tokyo Bay is habitat degradation, which is associated with two environmental phenomena: the loss of natural tidelands and shallow waters due to continuous reclamation of the shoreline for many years, and oxygen deficiency in the bottom water due to contamination by organic substances, which is caused by the excessive loading of nutrients in the water as a result of human activities.

Because of the growing population of the metropolis, the coast of Tokyo Bay has been subject to landfill since the Edo period. Reclamation was promoted on an extensive scale particularly after the 1960s [51] and along with the advancement of dredging technology. Coastal prefectural governors and mayors of several large coastal cities, who were in charge of shoreline and port management, licensed landfill projects eagerly for the most part to promote such development.

During the course of reclamation, many bay fisherfolk were forced to relinquish their fishing rights. Fisherfolk in the Tokyo Metropolis relinquished all their rights to fish in Tokyo Bay in 1962, and some 25,000 hectares of land, approximately 20% of the area of the bay, was reclaimed through waterfront redevelopment projects implemented from the 1980s to the 1990s. The number of fisherfolk of the whole bay decreased from approximately 23,400 in 1968 to approximately 6000 in 2003 [52]. At present, most fisherfolk who operate in the inner reaches of the bay run boats for recreational fishing or for restaurants.

Along with the industrial development on the coast, water pollution caused by the disposal of industrial wastewater had been a serious social problem until the beginning of the 1970s. With tighter controls on industrial wastewater disposal and changes in the industrial structure, however, the concern of people about the environment in Tokyo Bay shifted to habitat degradation due to the occurrence of a chain of events, such as chronic enrichment caused chiefly by household effluent and red tide, as well as oxygen deficiency in the lower water layers and blue tide [53]. This chain of water pollution problems was considered the major cause of decline in the catch of Edomae fishery species, including short-necked clam, mantis shrimp, and conger eel.

3.2. Coastal Governance

In the first half of the 1980s, those who became increasingly concerned about the ongoing bayside development without the future prospect of striking a balance between development and conservation appealed to the government for the formulation of a bay plan modeled after America's San Francisco Bay. However, no coastal zone management plan for Tokyo Bay was realized.

In the 1990s, after Agenda 21, the scope of coastal management in Japan was broadened from the previous focus of protecting human lives and properties, to environmental conservation. After two important environment-related laws were enacted (The Basic Environmental Law in 1993 and the Environmental Impact Assessment Law in 1997), the River Law (1964) was amended in 1997 to include "environmental conservation" in its purposes, and the Seashore Law (1956) was amended in 1999 to include "coastal environmental protection and conservation" and "adequate public use" in its purposes. The above changes in coast-related laws were followed by a move for ICM in the late 1990s. The integrated management of coastal areas was, for the first time, included in the Fifth National Comprehensive Development Plan published in 1998. A study group was formed by The Ministry of Land, Infrastructure, and Transportation (MILT), the function of which was to prepare a proposal for ICM [54]. The implementation of ICM was stipulated in The Basic Marine Law enacted in 2007, followed by The Basic Plan on Ocean Policy [55] developed in 2008, which aimed to promote comprehensive coastal zone management, coordination of coastal zone use, and measures to establish cooperative relationships for ICM. Unfortunately, however, ICM has yet to be implemented.

On the other hand, in the third decision made by the Urban Renaissance Project in December 2003, the Urban Renaissance Headquarters of the Cabinet Office announced that it would strive to restore the sea in major urban areas where water pollution had become chronic. Following this decision, the Tokyo Bay Renaissance Promotion Conference, which was participated by representatives of seven prefectures and cities along the bay and related national government agencies, developed a 10-year action plan to restore Tokyo Bay, and the plan was implemented in the fiscal year of 2003 [56].

This action plan was similar to the ICM plan in terms of integrity in that many related administrative agencies were involved in the effort. It was also similar in terms of objective as it aimed to reduce the amount of pollutants that flow into the bay from the surrounding land areas and to implement water purification measures for the sea area in order to improve the environment, including water quality, and increase accessibility to the seashore. Still, the action plan differed in essence from the ICM plan as administrative agencies were mainly responsible for all processes ranging from planning to assessment, and stakeholders, such as citizen parties who are concerned about the bay environment or fisherfolk, whose livelihood is dependent on the bay, were not involved [57].

4. Data

This study consisted of the analysis of projects conducted from August 2008 through November 2010 in the Edomae ESD program. The Edomae ESD program was steered by a working group of about a dozen volunteer faculty members from diverse academic fields, including ichthyology, biological, chemical, and physical oceanography, fisheries economics, coastal management, and

education. The program had evolved independently from the Japanese government's initiatives and with relatively small funding that was provided on an apply-and-contract basis for individual projects.

Four Café events [58] (August 2008; March 2009; September 2009; November 2010), two one-day programs (June and October 2009), and two courses each composed of several sessions (September 2009–February 2010; April 2010–September 2010) were presented as examples of the projects. The projects were held independently of each other.

As the program intended to include higher education for TUMSAT students, all the projects involved several (at least three) graduate and undergraduate students, some projects bore course credits, and others offered payment for the students' contribution. At the same time, as the program objective was to promote discussions among stakeholders, sessions for participatory workshops or at least dialogs among participants were embedded in the course.

The major data used in the research were obtained from reflections of each project, diagrams (including cards written by participants), and transcriptions of the activities. Other data, including articles of newsletters published after the projects and minutes of staff meetings, were also used. All the projects more or less included sessions of ice breaking, dialog or discussion, and reflection, which were similar to the participatory learning and action process [59]. The affinity diagram technique using cards [60] was used in the dialog or discussion session. Participants were asked to make verbal comments or written comments on cards or sheets of paper in the reflection session.

5. The Case of Edomae ESD Program

5.1. People Involved in the Program

In the course of the Edomae ESD program, possible collaborators were identified (Table 1). As the program aimed to associate the university's higher education with university-community partnerships, graduate and undergraduate students from TUMSAT and residents of coastal communities were assumed to be involved. Museum and aquarium curators and environmental education interpreters who conduct experiential programs on the coast were potential collaborators. Schoolteachers might be interested in the program as a knowledge base to teach coastal topics in their classes at school. Fisherfolk were the key persons for coastal governance, not only because their livelihoods were deeply related to coastal sustainability and they had fishing rights or permits that legally positioned them in the governance system, but also because they were living witnesses of changes in the coastal environment and resources as well as the use, culture, and history thereof. Local governments of the prefectural level and of some major cities on the coast were in charge of port and coastal management, whereas smaller units of municipal governments sought for ways of collaborating with residents in town planning. Their concerns about or interest in Tokyo Bay, the potential and resources for coastal governance, and the challenges for the future are summarized in Table 1.

Table 1. Possible collaborators of the Edomae Education for Sustainable Development (ESD) program.

	Sector/Affiliation	Concern about/interest in the coast	Potential/resources for coastal governance	Needs/future challenges
Faculty staff, Students	TUMSAT	Coastal ESD in both its curricula and community partnerships	Scientific knowledge Facilities, such as laboratory and training vessels	Transform style from conventional delivery of knowledge into social learning
Local residents	Community/town assemblies of coastal areas	Environmental soundness/ recreational activities	Voice as taxpayers Interest in the bay	Hope to experience the coast and to hold dialogs on coastal issues
Staff, including curators	Museums/aquariums	Coastal science/culture/history education	Museum collections/animals as educational material Scientific knowledge Public education facilities	Look for ways to communicate with visitors Good programs to utilize coastal resources
Environmental education interpreters	Informal education	Coastal environment/animals	Interpretation experience and techniques Offer experiential programs on the coast	Brush up and update scientific knowledge and skills
Fisherfolk/fishery cooperatives/fish marketers/fish processers	Fishing industry	Sustainability and stability of catch and fish price Seafood safety related to production environment	Fisherfolk's knowledge based on coastal experience Privilege to influence coastal policies	Gain more public support to sustain coastal resources and fishery
Local governments of coastal cities	Shoreline/port managers	Water Environment/shoreline/port management	Permits to access shoreline	Look for ways to collaborate with citizens

5.2. Initiation of the Program: Developing the Framework

Immediately after the program was launched (October 2006–March 2007), the focus of the activities was on the development of the program's framework with minimal funding from the Ministry of Environment [61].

Three "sharing" activities were presumed to be the pillars of the program:

- Café: Sharing knowledge of various aspects of Tokyo Bay, including its environment, natural resources, history, and fishing activities;
- Mimibukuro: Sharing experiences through fieldwork; and
- Terakoya: Sharing ideas with each other by holding dialogs of what individuals have in mind or have learned in the program.

Then, the program focused on developing Edomae ESD leaders because sustainable social development requires citizens who have an understanding of and an interest in environmental management and who assume a positive and active role in the development of a democratic community. The program therefore targeted local leaders who are active in the community as well as TUMSAT students.

A summary of activities in the initial phase of the program suggested that the activities provided a cross-cultural experience for the working group in two ways. First, the working group learned about the activities and opinions of people who are involved with Tokyo Bay, *i.e.,* those whose lives are in one way or the other related to Tokyo Bay, including fisherfolk and environmental education interpreters, through interviews and workshops. Second, within the working group, faculty members and students from various fields, such as natural sciences, social sciences, and the humanities, gained an opportunity to learn different aspects that made them familiar with each other's field of expertise and approaches to academic subjects. At this stage, the meaning of the term "learning" was strongly recognized in the social context. It no longer meant transferring knowledge from academia to society or from teachers to students; it has come to encompass social constructivist perspectives that understanding is expected to be gained through interactions with others and the meaning of phenomena is a product of dialog with others [62].

Subsequently, two specific regional cooperation activities were conducted (April 2007 to March 2008) [63]. The foremost lesson learned from the activities was that in order for a university to work closely with the local community where it operates, it is necessary to find intermediaries who are already working in the community. Moreover, students who participated in the activities in the local community also became intermediaries who bridged the university and the community. This finding indicated that those who participated in the Edomae ESD program had the opportunity to learn much more from each other than those who did not do so.

The lessons learned from this initiation phase of the program led us to envision a combined concept of service learning for the students and PAR for the community as the approach of the program linking the scholarship of engagement and HESD for coastal sustainability. Underlying this program concept are the presumption that participation is pursued through mutual trust and learning [64], and high hopes for future social learning that is defined by "a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social

interactions between actors within social networks," as the basis for the sustainable management of natural environment and resources [65].

5.3. Evolution of the Program: Extending the Scale of Collaboration

Of the more than twenty projects conducted from August 2008 to November 2010, five participatory projects are presented in Table 2. In this period, the program focused on "Café" activities that aimed to share knowledge with people, although other activities of "Mimibukuro" (sharing experiences) and "Terakoya" (sharing ideas) were also incorporated in each project. A model of a project is shown in Figure 1. Any project or session started with "Cafe" and ended with "Terakoya," whereas "Mimibukuro" or fieldwork was included when the schedule allowed.

In the university-community partnerships, the scale of collaboration (Table 1) was extended in the course of the program to include mainly fisherfolk (Projects A and E), museums and their staff members (Projects B, D, and E), and environmental education interpreters (Project C). All the projects were favorably evaluated by the participants and the collaborators, including the students, particularly the "Mimibukuro" and "Terakoya" activities that took place in the form of dialog, discussion, or fieldwork for each project.

As regards service learning projects, both graduate and undergraduate students were actively involved in all the projects; without their assistance, the projects would have been much more difficult to conduct. For instance, in the environmental education project on the coast in collaboration with environmental education interpreters (Project C), some students designed and facilitated ice-breaking activities with the help of the interpreters and faculty members, whereas others helped participants observe planktons in the stomachs of cleared and stained specimens of gobies mounted on individual microscopes. In Project D, on the other hand, the primary activity of which was Café, three of the students who were assisting in the activities, by using simili papers and Post-it, created cognitive maps to enhance visualization while listening to the lectures. The created maps were used in the following question-and-answer time for each session and in the reflection session at the end of the course. Such students' assistance was highly appreciated by the participants.

Participation in individual projects was free of charge except Project C, which involved professional environmental education interpreters and chartering a vessel. The funding for individual projects included research grants from Nippon Life Insurance Foundation (Projects C, D, and E) 2008–2010 for conducting capacity development for ICM for Tokyo Bay, research grants from Japan Science and Technology Agency for Café Scientifique (Project A), and subsidies by local governments, which were specific to a lifelong learning course (Project B). Project C also received funding from a private company that was eager to support environmental education on the coast of Tokyo Bay. Major expenditures included gratuities for environmental education interpreters and students as necessary; expenses for newsletter publication; stationary supplies; and chartering a vessel for a bay cruise as necessary.

Table 2. Five projects conducted in the Edomae ESD program from August 2008–September 2010.

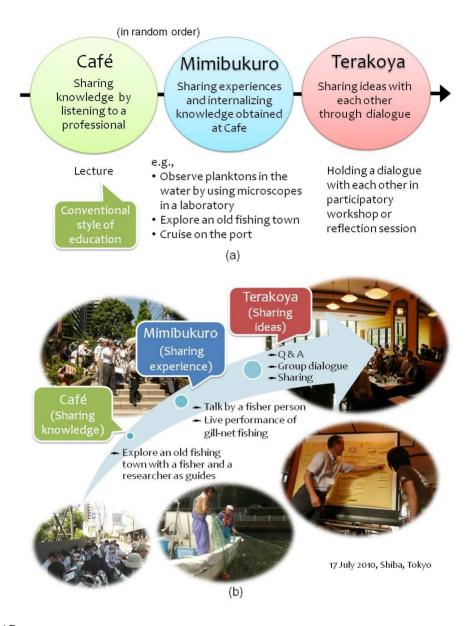| Title (date; reference)	Activity [time]	Topic	No. of participants [publicity]/Collaborators outside campus	Partnership with/Funding by	☺ Advantages ☹ Challenges for the future
A. Fish Café (August 2008; [66]), (September 2009; [67]), (November 2010)	Café to listen to both fisherfolk & researchers; Terakoya as Q&A session [3 h]	Fishery of sea bass; short-necked clam; mantis shrimp	>30 [website; posters]//Approx. 10 students & one fisher for each Café	University Library/JST	☺ Learn both experiential and scientific knowledge ☹ Lack of continuity in dialog
B. Tokyo Bay Café (March 2009; [68])	Café to listen to scientists; Terakoya as Q&A session [2 h]	Water quality & fish fauna	>50 [website; posters]/Five students, museum curators	A folklore museum & communities/A local government	☺ Learn scientific knowledge ☹ Insufficient time for dialog
C. Kasai Seaside Exploration Program (June & October 2009; [69,70])	Café to listen to scientists; Mimibukuro on cruise and laboratory work; Terakoya as reflection session [6.5 h]	Tidal flat ecosystem	Approx. 40 school children and their parents in total [website]/10 students, 12 environmental education interpreters	Kasai Seaside Environmental Education Forum/A private company's sponsorship; A private foundation	☺ Intimate collaboration with interpreters ☹ Load on faculty staff for preparation of laboratory work
D. Edomae Meister Course (September 2009–February 2010; [71])	Café on eight topics; Terakoya as a participatory workshop at the beginning and the end, respectively [2 h/day; a five-day course held monthly for half a year]	A chronological view; commercial & recreational fishing; water pollution & dynamics; abyssal fish; fish market & processing	>40 [website; posters]/Approx. 10 students; museum curators; one fisher; two fish dealers; researchers from other institutes	A local folklore museum/A private foundation	☺ Dealt with a variety of topics on the coast ☺ Cognitive mapping by students for each lecture ☹ Load on faculty staff for coordination ☹ Miss a follow-up course

Table 2. *Cont.*

Title (date; reference)	Activity [time]	Topic	No. of participants [publicity]/Collaborators outside campus	Partnership with/Funding by	☺ Advantages ☹ Challenges for the future
E. Edomae ESD Shina-gawa Course (April 2010–September 2010; [72])	Café & Mimibukuro to learn the three major concerns for coastal sustainability; Terakoya as a participatory workshop at the beginning and the end, respectively [3 h/day, a six-day course held monthly for half a year]	Coastal development; water quality; fishery	34 [website; posters]/Approx. 10 students; museum curators; one fisher	Museum of Maritime Science; Tokyo Port Museum/A private foundation; JST	☺ Abundant opportunities for dialog ☺ Individual participants conducted research ☹ Load on faculty staff for coordination ☹ Miss a follow-up course

Activities: Café for sharing knowledge; Mimibukuro for sharing experiences; Terakoya for sharing ideas; JST: Japan Science and Technology Agency.

Figure 1. (**a**) Model of a project of the Edomae ESD program (top). "Café" and "Terakoya" activities are premised in any project, whereas "Mimibukuro" is held when the schedule allowed; (**b**) An example of practice in the session of exploring an old fishing town in The Edomae ESD Shinagawa Course (Project E in Table 2) (bottom).

(a)

(b)

5.4. Piloting PAR

The concept of PAR was envisioned for the first time in the design of Project E, a six-day course held monthly for half a year from April–September 2010. "Mimibukuro" (sharing experiences) and "Terakoya" (sharing ideas) were also incorporated in each project.

In the first session, the participants talked about their visions of and subjects of interest regarding Tokyo Bay in small groups. The following three sessions focused on the three topics of coastal development, water quality, and coastal fishery, *i.e.*, major concerns for coastal sustainability. Each session consisted of such Edomae ESD activities as "Café" or a talk by a researcher or a professional, including a port manager or a fisher; "Mimibukuro" or fieldwork on a bay cruise on the Port of Tokyo,

laboratory work on water quality and microscopy, or exploration of old fishery towns; and "Terakoya" or dialogs or discussion. In the session before the final one, the participants were grouped again based on their interests to reflect on what they had learned by holding discussions in a small group, and asked to present their research results. In the final session, after presenting individual research results, the participants discussed their visions of the inner reaches of Tokyo Bay, which were visualized and shared again with the assistance of the students.

The participants' comments in the reflection of Project E are as follows:

"The coast of Tokyo Bay has been landfilled in such a way that we may not be able to bring it back to its original state. Nevertheless, we can get together to brainstorm on ways to improve the environment."

"I very much enjoyed the process of thinking of new points for improvement [of Tokyo Bay] by talking to other participants."

"My view and consciousness of Tokyo Bay have changed during the course. I had initially thought we could not do anything to change things, but now I found that we could do so."

TUMSTAT faculty members also learned from the participants, as summarized in one professor's comment in the closing address of Project E.

"I have prided myself on how much I know about Tokyo Bay, but [on hearing the participants' research results for Tokyo Bay], I found that there are still so many aspects about the bay that I do not know. I was also surprised that everyone has strong communication skills."

Thus, not only did all the participants learn about Tokyo Bay, they have also changed their perspectives in the course and expressed willingness to be involved. Those comments suggest the potential of the program for social learning that forms the basis for natural environment and resource management [65].

6. Challenges for the Future

Although the program started with the old-fashioned idea of university-community partnership, *i.e.*, transferring knowledge from university to the communities, it evolved to encompass the perspectives of the engagement of scholarship, *i.e.*, a reciprocal, collaborative relationship among coastal stakeholders toward social learning. The combined concept of service learning for the students and PAR for the community was envisioned as the approach of the program linking university-community partnerships and higher education in the process, and was proven to be an adequate approach to promote social learning with a university-hosted program for coastal sustainability. The program was consistent with the mission of the university, *i.e.*, offering higher education for students, and presented a solution to the problem of promoting HESD or university involvement in community-based work [38,49]. The involvement of students in the program activities facilitated learning of all the participants, including faculty members. At the same time, the students were able to gain interpretation and facilitation skills thought to be essential in higher education for sustainable coastal management [44].

Still, some challenges were identified in the course of the program, as shown in Table 2. Those include: (1) ensuring continuity of learning and (2) reducing the heavy workload of faculty members who are actively involved in program preparation and coordination.

6.1. Ensuring Continuity of Learning

The most important issue to be addressed is how to ensure continuity of learning with the program. As each project was conducted separately without a follow-up course, there was no way to sustain people's enthusiasm in a project into the next phase. A more structured course is needed to continue the dialogs held in the program, namely, there is a need to develop a forum for dialogs on an extended scale to discuss future visions shared by all the participants, including the program staff, thereby influencing decision-making for the bay environment. Related to this issue is funding for the program, mainly because the involvement of professional environmental education interpreters and chartering a vessel were indispensable to improve the quality of learning. Such expenditures put a large burden on the limited budget allocated by the university for research and education. Those issues should be given further thought in future studies.

6.2. Reducing the Heavy Workload of Faculty Members Involved in Program Preparation and Coordination

The major reason for the difficulty of having a structured course is that the program is based on volunteer efforts of the working group and is not incorporated in the university's formal curricula, nor does the university have a well-equipped lifelong learning course that adopts the program. Under these circumstances, there is no denying that the regional cooperation project imposes a heavy burden on the working group of faculty members in terms of time spent and labor required. This also hinders the recruitment of new faculty members on campus to expand an activity as such kinds of activities are not rewarded in the current university system in which an academician's achievement is evaluated mainly by the publication of research papers [37].

One possible solution is to redesign the university's curricula and to link HESD and PAR. This includes changing the formal curricula to involve more students and faculty in coastal ESD, setting up a lifelong learning course that promotes PAR for the community, and establishing an administrative section that coordinates the program. This direction, in which involved individuals have not only an opportunity to learn coastal systems and issues but also a place for dialog and further contributions to coastal sustainability, is a step that the Edomae ESD program can take toward the institutionalization of public participation in coastal governance. The authors do not claim preference for the national government's initiatives that have been adopted in many HESD programs in Japan; rather, they would like to emphasize the possibilities offered by the engagement of scholarship in the capacity development for coastal sustainability by focusing on community-based efforts.

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Conflicts of Interest

The authors declare no conflict of interest.

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