

Article

In Transition towards Sustainability: Bridging the Business and Education Sectors of Regional Centre of Expertise Greater Sendai Using Education for Sustainable Development-Based Social Learning

Paul Ofei-Manu^{1,2,*} and **Satoshi Shimano**²

¹ Institute for Global Environmental Strategies (IGES), 2108-11 Kamiyamaguchi, Hayama, Kanagawa 240-0115, Japan

² Miyagi University of Education, Environmental Education Center, 149 Aramaki Aza-Aoba, Aoba-ku, Sendai City, Miyagi 980-0845, Japan; E-Mail: satoshis@staff.miyakyo-u.ac.jp

* Author to whom correspondence should be addressed; E-Mail: ofei-manu@iges.or.jp; Tel.: +81-46826-9606; Fax: +81-46855-3809.

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Abstract: This article discusses a business-school collaborative learning partnership in the Regional Centre of Expertise (RCE) on Education for Sustainable Development (ESD) in Greater Sendai. This partnership is further linked to a broader context of multi-stakeholder public participation in the RCE that was set up to advance the ESD agenda in the region. The authors propose a conceptual framework for multi-stakeholder, ESD-based social learning within the RCE with the aim of enabling the creation of a sustainability-literate society. This proposal is based on the results of students' prior experience in ESD activities, optimal age for ESD learning and future job choices presented in this paper, together with a reported article that the levels of sustainability of the two sectoral organizations were mixed and hence need improvement. The paper argues that it will be good to focus on bridging the business and education sectors by building ESD capacity of the children and youth in the formal education sector. It contends this could be done through collaborative learning using the government-mandated "Period of Integrated Studies" (PIS) in the Japanese primary and secondary school curriculum. Additionally, it will be appropriate for the RCE Greater Sendai Steering Committee to facilitate and coordinate the learning processes and also promote networking and cooperative interactions among the actors and stakeholders in the region. Recommendations for improvement of the

learning partnerships in RCE Greater Sendai are made for consideration at the local and national policy levels.

Keywords: sustainability; transition; partnership; collaboration; Regional Centre of Expertise; business; education; ESD-based social learning; capacity building

Nomenclature:

ESD = Education for Sustainable Development

DESD = Decade of Education for Sustainable Development

RCE = Regional Centre of Expertise

RCEGS = Regional Centre of Expertise Greater Sendai

ESDBSL = ESD-Based Social Learning

PIS = Period of Integrated Studies

PP = Public Participation

1. Introduction

One principal goal of sustainability is attaining a state where the planet's resource extraction, use and the resultant pollution by particularly humans will be within its carrying capacity [1]. However, the current state of the environment and its potential adverse impact on society brings into question the effectiveness of the present world's educational systems and business practices to meet humanity's present and changing needs [2].

The education and business sectors are both important in the transition towards sustainability. Education for Sustainable Development (ESD)-based capacity building, using a more encompassing form of learning and the full engagement of the sectoral organizations and society in sustainable practices is therefore important. Generally, business can contribute to sustainable development (SD) by using its ample financial and other resources, technologies [3], tools, such as CSR for educational/learning activities, and a skilled workforce that is knowledgeable in sustainability issues. In order to acquire this capacity, it is imperative that society undergoes a certain competence developing stage in their lives where the conventional discipline-based learning process is discontinued or significantly curtailed and a new, integrative pedagogy and more relevant skills are taught via a new learning platform that encourages partnership through collaboration [4].

A key aim of ESD is to empower learners across the age spectrum by developing the knowledge, skills, perspectives and values so that people can take up the responsibility of creating a sustainable future to be enjoyed by all [5,6]. The contribution of education through ESD can result in improvement in the quality of life of the people. It can also help create resilient individuals, groups or societies, capable of thinking holistically, systemically and integratively, and able to adapt to adverse environmental conditions using their acquired knowledge, values and skills. Against this backdrop, the UN Decade of Education for Sustainable Development (DESD) is to serve as a platform for learning for SD with the principles, practices and values of the same embedded in all spheres of education and

learning [7]. It has since entered its third and final phase, ending in 2014. Consequently, evaluation of ESD, of how learning and education has contributed to sustainability, is increasingly becoming important. And although exemplars in the form of capacity strategies, mechanisms, methods, practices and initiatives across various scales have been provided [7], further identification of capacity building measures aimed at individual, group or community level learning, in addition to implementing effective and relevant monitoring and evaluation mechanism(s) are important. The overall results achieved so far are mixed with modest accomplishments and also shortcomings.

Furthermore, the Regional Centre of Expertise (RCE) on ESD network—which includes RCE Greater Sendai (RCEGS)—was set up to advance the ESD agenda at the local and regional levels during the decade. However, it needs to strengthen or improve several aspects, including collaborative partnership, network coordination, monitoring and evaluation of the ESD-based program activities that involve education and learning across local scales.

This paper initially discusses a number of sustainability challenges, and provides a background literature on ESD in schools and companies, partnerships and collaboration. It is followed by an introduction on learning, social learning and the RCE concept. The results of the study are later presented followed by discussions and conclusions.

2. Conceptual Background

2.1. The Sustainability Challenge in the Education and Business Sectors

The transition to sustainability from the current state faces numerous challenges and the sustainability paradigm is expected to pragmatically address these challenge(s) by rejecting the argument that casualties in the environmental and societal realms are inevitable and acceptable consequences of economic development [2]. Rather, it should embrace a combined empirical assessment and normative claim, which, in current society-nature interactions, are not sustainable and that societal developmental paths should meet fundamental human needs now and in the future, within and across generations, maintaining the planet's biological resources and life-support systems [8–12]. They include environmental, socio-cultural, economic, temporal and ethical challenges. For example, ethical sustainability challenge, which is also a relational one, comprises both individual and systemic ethical challenges [13]. These ethical challenges are to get people to think beyond themselves, extend their personal and narrow self-interest into a much broader interest of the civil society with “more benevolent and democratic habits, and institutions more capable of building and rebuilding better societies” [13]. The recent unethical practices that have kept the global economy in recession is a case in point.

Without doubt however, the greatest challenge to the sustainability transition is the structural realignment of mankind's dominant economic development models away from energy- and material-intensive processes and an inflexible preoccupation with rapid output growth of commodities [8,14,15]. Another challenge is the need to radically change the present methods of assessment in education and learning: from a “narrow” assessment that is focused on a few performance indicators that are easy to measure, to include more of the collaborative/interactive networking values-based aspects rooted in partnerships that are equally important but are more difficult to measure.

Transforming our worldview not only in the context of the *way* we learn about our world, which influences how we use resources, but also considering *other ways* of learning, including understanding complexity as it relates to the planet and producing new values in order to relate better to the world and its people [16,17] is another challenge.

From the business perspective, an added challenge is changing companies by engaging with people with the aim of helping both present and future generations to become sustainable [11]. Companies face the tough challenge of unlearning their own methods of doing things, of fundamentally re-orienting society towards sustainable consumption through education, against the backdrop of an economy largely steered by business; where a closed loop, “cradle to cradle” approach to material flows rather than the linear, “cradle to grave” resource use [8] is embraced. Some specific business sustainability challenges are (1) How to integrate particularly environmental externalities; (2) How to avoid/reduce negative social and environmental impacts; (3) How to identify opportunities caused by (more) sustainable behavior; (4) Concern that “ecological modernization” is structured to perpetuate the economic advantages of current global elites and water down a more sweeping sustainability challenge which would include demands on sustainability: corporate social responsibility; (5) Structurally realigning the economic development objectives, combining dematerialization and eco-efficiency with commonsense regulation of wealth creation incentives against the backdrop of social justice; (6) Effectively integrating regulation for sustainability across policy sectors and political frontiers; (7) Routinely employing sustainability assessment, informed by extensive stakeholder participation; (8) Ascribing the protection of rights to critical sustainability entitlements for all planetary citizens; and (9) Promoting altruism and ecologically-enlightened social identities [8].

A key element of education re-orientation in schools is innovation within the curriculum and according to McKeown [2], a major challenge facing nations therefore is whether their educators should teach about sustainability or change the goals and methods of education to achieve sustainability.

2.2. Education and Learning for Sustainability in Schools and Companies

2.2.1. ESD

Effective strategies for addressing sustainability challenges from the local to global level are needed, and there is broad consensus that education—including all its components—must be the driving force [9]. Human resources are therefore the key agents to achieving sustainable development through appropriate development of human capacity using a broad range of educational means such as formal and non-formal education (and learning), training and public awareness raising [18,19]. In that regard, the realization of a shortfall in human capacity for sustainable development by many governmental, non-governmental and international institutions has led to a call for the development and enhancement of ESD. In fact all sectors were encouraged by Chapter 36 of Agenda 21 to provide training for their leaders and workers in sustainability management [20].

ESD expresses a “complex of concepts, theoretical constructs, policy prescripts and practical methods and tools” that convert education and learning to the socio-economic and ecological dimensions of sustainable development [21]. ESD is also about development of knowledge, understanding, perceptions, and values that result in the empowerment of the recipients and consequently enable their

participation in decisions about changes in their lifestyles and behaviors that will improve the quality of life at present and sustain the planet for posterity. ESD might then be seen as the total sum of diverse ways to become a “learning society” in which people learn from and with one another and collectively become more resilient to deal with sustainability challenges—induced insecurity, complexity and risks. It provides the opportunity to address sustainability challenges by integrating the principles, knowledge, perceptions, values and practices of sustainable development directly into education. As a lifelong learning process, that is holistic and interdisciplinary in nature [2,19], ESD is also values-driven, locally relevant and built on principles of critical thinking and problem-solving.

2.2.2. ESD and Business

ESD is important for business as it helps in improving business practices and assists the process towards sustainability. For example, ESD was considered by company workers from the automobile/computer manufacturing, meat/drink processing, retail and service (and educators) in particular, in South Miyagi in Japan as the most important component of environmental pollution prevention and one of the most important for its control [22,23]. The level of knowledge of ESD could therefore be used as one of the indicators of sustainability capacity in organizations. Moreover, it provides opportunities for increased engagement between the private sector, civil society, governments, employees and trade unions—through multi-stakeholder partnerships. ESD also helps in preparing a skilled, informed and responsible workforce and employees and it raises the awareness of all stakeholders, such as customers, suppliers and employees about sustainability issues and challenges. Although an environmental or sustainability report is the foundation for information disclosure on a company’s environmental activities, and the environmental management system (EMS) is aimed at continuous improvement of the environmental performance of companies towards sustainability [19,24], re-orienting education and training in companies by incorporating ESD into these two tools would be effective in enhancing sustainability knowledge and skills within a company [22]. It should be noted however, that several voluntary corporate initiatives described by Lozano [11]—partly to help the corporate community improve their understanding of those initiatives and the contribution of the same to the company system—are good sources of knowledge and skills for strengthening ESD in business.

2.2.3. ESD in Schools

An aspect of ESD that needs to be considered is its recognition as a multi-stakeholder endeavor and the competencies it enables students to acquire to shape their future within the framework of sustainability, without being yet another addition to the education agenda or curriculum [2,25]. Characteristics that promote ESD in schools include policy mandates that allow the implementation of the whole-school management system, flexibility of teachers to innovate within the curriculum and re-orientate teaching towards more locally-relevant and practical solutions to sustainability problems, coherence of the ESD concept with other educational policies already in place, links with other relevant institutions, including NGOs, universities and research organizations, companies and sister schools, continuous professional development of teachers (CPD), and means of assessing the effectiveness of ESD-related activities [1,26]. Irrespective of the approach, ESD in its real and effective forms should give students the skills, perspectives, values, and knowledge to live sustainably

in their communities. The concept of a whole school approach to sustainability or “sustainable schools” [1,26] (and several references therein) has ESD as the foundation. ESD in schools also poses a wider question regarding whether it has an agenda that is based on seeking behavioral change or one that is focused on learning [27,28] through capacity building and critical thinking [29].

2.2.4. Challenges Facing ESD Implementation

There are however, challenges that face the implementation of the ESD program. They include (1) The ability to orientate present and future human behavior toward sustainability; (2) Use of critical, values-driven, systems thinking, interdisciplinary, multi-method, holistic, participatory approaches to solve problems and make decisions that are locally relevant [30,31]; (3) Use of appropriate indicators and methods for monitoring and evaluation; (4) Support for ESD-related research; (5) Focused capacity building; (6) Coordination and involvement of the media, (7) Regional unevenness of ESD implementation; (8) Awareness and understanding of ESD in the wider educational community and in the general public; (9) The re-orientation of curricula and the availability of sufficient funds for ESD programs [30] (and the references therein) and [31]; (10) Lack of ESD resource personnel and ESD-competent teachers; (11) Low level of political support; (12) Lack of appropriate tools for ESD implementation; (13) Weak inter-agency collaboration and overall coordination and weak linkage between the top (policy) and the bottom (grassroots) due to a lack of coherent policy, such as a guidance document or an action plan [31,32]; and (14) Lack of proper coordination of activities in the various education settings of formal, non-formal and informal education.

2.2.5. Partnerships and Collaboration

To meet these sustainability/ESD challenges requires bringing together of all forms of capital (social, natural, cultural, biological, financial and technological [33]; or manufactured, natural, human and social, [34]) from all sectors through collaborative partnerships and by making education/learning central to building capacity of the stakeholders. Partnering is a good strategy by which individuals, groups or organizations deal with common challenges [35]. Partnership and collaboration can be affected by governance, managerial control, funding streams, local knowledge, continuity of resources, proximity, level of publicity, type of communication, types of approach used to deal with developing the partnership as well as solving problems within it, quality and nature of the leadership and the size and nature of the partnership [36–38]. Collaboration, which is seen as a form of partnership, a “network of relationships” [39] also denotes developing new understanding by solving problems using information, diverse insights and some spontaneity [40]. Collaboration consists of the following stages: emergence, evolution, implementation and transformation [35]. In addition, it is characterized by principles including: (1) Commonality of interests of the partners; (2) Familiarity of the constituent members of the partnership; (3) A sense of ownership; and (4) An honest, open communication [35]. Collaborative partnerships are usually seen to be successful due to the clear definition of roles and responsibilities taken on by the stakeholders [35,41] and the mutual trust and communication developed between stakeholders. Although a clear distinction between the two terms is blurred in the literature, their increasing importance in all sectors—public, private, corporate or non-profit cannot be overemphasized [41,42]. Collaboration and partnerships are both important, for both the corporate and

education sectors. For example, students exposed to high levels of partnership activities were more likely to agree that those activities had a positive impact on their attitudes and skills or can even affect their academic motivation and performance than those with lower levels of exposure [43]. Lozano [44] argues that collaborative approaches like engaging with stakeholders can be used to strengthen sustainability-oriented organizations.

2.3. Learning and Social Learning: Capacity Building through ESD-Based Social Learning

2.3.1. Learning

The definition of learning has become complex as a result of several learning theories [45], the fields/disciplines underlying it [46] and types: individual, groups, organizational, *etc.* [47–50]. Learning is a continuous and active process by which learners take in information and update their cognitions and behavior in relation to the environment [17,51], the way by which individuals or a group acquire capacity for adapting to unfavorable conditions. As a process, that involves collaboration as well as reflection [52]. Learning could also have “different meanings” [48,50], thus dependent on whether the processes being referred to involve individuals, collective agents, or wider social systems [49,53]. Learning is considered effective if it can bring about tangible and immediately useful outcomes with regards to knowledge, understanding, skills, values, *etc.*, and also be able to reinforce the capability and motivation essential for further learning [52].

2.3.2. Social Learning

To master the challenges that sustainability presents, individual learning is required, and so are the processes of learning across the scales of human systems, ranging from groups, organizations, human societies and mankind [41,46–50]. Therefore, it is imperative that sustainability learning is seen as a concept with multiple levels, and consisting of individual, group, organizational and societal learning, and also as processes of learning human systems that places a strong emphasis on the role of transdisciplinarity [9,52].

Social learning has become synonymous with different types of learning processes and consequently, its meaning has become somewhat vague [29,46]. It “entails developing new relational capacities, both between social agents, in the form of learning how to collaborate and understand others’ roles and capacities differently” [54]. According to Reed *et al.* [55], social learning is the “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.” With the ability to produce important and useful outcomes with respect to knowledge, understanding, perceptions, skills and values, and also, reinforce the capability and motivation for further learning [52,56], effective social learning is also a reflective and collaborative process that can be extended across communities and generations. Central to social learning are “multi-party processes that are influenced by the context to which they are embedded and produce outcomes that may lead to changes in the context and thus to a cyclic and iterative process of change” [53]. This context of social learning comprises the governance structure as well as the environment within which the interrelations and interactions take place among actors [53]. One can therefore understand and manage environmental/sustainability issues

by using social learning as an approach [46,53,57]. For example, social learners gain adaptive capacity and skills that can lead to sustained processes of attitudinal and behavioral change through interactions [58]. They can also build up experience needed to cope with uncertainty and change [59] in their environment. Lately, the concept of social learning has “coincided with the thrust for public participation and the growing importance given to sustainable development” [59].

According to Tabara and Pahl-Wostl [53], there is a whole new way of thinking about social learning in the context of sustainability. They draw a contrast between sustainability learning and social learning by saying that the essentials for long-term sustainability of, say, social-ecological systems are not necessarily always improved by the outcomes of social learning processes, “namely the co-adaptive systemic capacity of agents to anticipate and deal with the unintended, undesired, and irreversible negative effects of development”. Milbrath [60] contended that in order to move towards sustainability, social learning must include (1) An understanding by people of the important that roles, values and beliefs play in shaping reality; (2) An appreciation of how complex and interconnected the ecosystems are and their implications for social action; (3) A holistic, systemic, thinking in an integrative manner; (4) The avoidance of interfering with the systems and cycles of nature and the recognition of the limits to growth, and (5) An empathy with an extension of our compassion to people of other nations, species, and the preservation for future generations of the “sanctity” of the ecosphere and the eventual survival of all humanity. The main difference therefore between sustainability learning and social learning according to Tabara and Pahl-Wostl [53], is the content of what is to be learned and the assessment criteria used to address the content.

ESD-based social learning (ESDBSL) therefore could be denoted as a learning process in the context of the principles of ESD whose outcome(s) improve what are considered as essential for sustainability, *i.e.*, an understanding of sustainability that social interplay between actors within social networks becomes situated within the “communities of practice”.

Isolated literature on school-business collaborative partnerships regarding ESD-based social learning has been reported in Japan. Yoshizumi and Miyaguchi [61] reported a local implementation of the principles of ESD that involved collaboration between an NGO called Learning and Ecological Activities Foundation for Children (LEAF) and schools and businesses in Nishinomiya City, Japan. LEAF initiated a series of environmental learning activities that specifically facilitated 90 private sector corporations in developing and implementing seminars and environmental learning programs for elementary and junior high school students. As the corporations participated in the theme projects in the process, corporate employees at various levels were also afforded the opportunity to learn about environmental issues. Oikawa [62] reported a collaborative learning partnership between students and teachers of Omose Elementary in Japan and their counterparts in Lincoln Elementary in the USA through the sharing of the results of their paired environmental projects using computers. In the course of the project, Omose Elementary made other local links with Miyagi University of Education, Japan, the local education administration, other schools and institutions and the local community. A report by Hirayama [63] indicated an increasing trend of major manufacturing companies in Japan distributing environmental education and awareness materials to the community, either by giving text prints or through their websites or providing facilities for visits and dispatching their employees as visiting teachers. In their paper, Ofei-Manu and Shimano [30] describe the social learning processes of a socio-ecological system in Osaki-Tajiri, a focal point for ESD in RCE Greater Sendai in Miyagi,

Japan. With capacity building through learning for the sustainable/wise use of wetlands-paddies' goods and services as the main objective, the stakeholders' ESD-linked social learning processes were underpinned by their interrelationships with each other through knowledge transfer, co-production and exchange, adaptive learning and awareness creation. It was further underpinned by their interactions with biophysical/ecological components, and as a consequence, produced outcomes including value and attitudinal change toward the natural environment, effective governance to maintain the integrity of these wetland-paddies, and a re-oriented method of agriculture.

Reflecting on the idea of studying an RCE as a social learning experiment using an empirical research agenda set in RCE Makana, in South Africa, Lotz-Sisitka *et al.* [64] presented an overview of the starting points of social learning by describing the key issues, educational foci and the areas of engagement to develop in the RCE. They also developed an open process framework that looks at sustainability practices and reflexive social learning through enquiry, action and deliberation in the classroom, school and community. To attain its goal of transformative education that promotes sustainable lifestyles and livelihoods in the region, RCE Saskatchewan conducted an investigation to identify ESD projects within its jurisdiction using an approach that was: (1) regional; (2) strength-based—to identify the regional ESD issue areas already existing so that productive networking could be built; and (3) institutional—by partnering with organizations to identify their ESD projects for collaboration [65].

2.4. Regional Centre of Expertise on ESD Greater Sendai (RCEGS)

Society encompasses diverse stakeholders and various levels of interactions between these stakeholders and thus brings about an environment that facilitates the lifelong learning development process of the human resource. An ideal Regional Centre of Expertise (RCE) acting as a microcosm of the region/area (as RCEs can vary in size, affiliations and functions, *etc.*) should be able to identify local concerns and address them in an integrated manner. Considered as an institutional mechanism that facilitates the capacity development for sustainable development in a region [66], the RCE is to serve as a framework for the production, harnessing, exchange and integration of knowledge and information through close co-operation with different institutions that include all/most stakeholders in the region. It also facilitates the joint development of innovative programs towards ESD. In addition to redefining existing environmental activities in alignment with the principles of ESD at the regional and local levels, RCEs can enable the duplication and dissemination of good ESD practices [30] (and the references therein). The RCE has also evolved as a concept. Originally, it was supposed to serve “the purposes of knowledge management, knowledge transfer and delivery of ESD to the community” [66]. Mochizuki and Fadeeva [66] reported that recently, at one end of the spectrum of the RCE network is the representation of RCE as a “community of practice”, an institutional mechanism for “social learning.” On the other end, it is interpreted as a “platform for information exchange and sharing” [66].

Most of the subcomponents of the core elements of the RCE are capable of serving as levers for capacity building (*i.e.*, institutional mandates, visions and goals, management structure, leadership involvement, engagement of actors, R&D, knowledge sharing, strategies for collaboration, *etc.* [67]). The RCE can therefore act as an umbrella facilitating capacity development through multi-sectoral, multi-stakeholder partnerships and provide research, learning and other opportunities for all existing components of society in the region.

In search of a strategy that would help translate the ESD agenda at the local level, the United Nations University-Institute of Advanced Studies (UNU-IAS) has championed the establishment of RCEs on ESD and supported them around the globe [68]. RCE Greater Sendai (hereafter RCEGS) in Miyagi, Japan, is one of the RCE pioneers and has been coordinating the ESD practices of several stakeholders under its umbrella since its establishment in 2005, with Miyagi University of Education as its secretariat. The RCEGS's objectives and five focal points of activities, each including several actors, have been location-specific and are described in Ofei-Manu and Shimano [30] and Ofei-Manu and Shimano [1].

One particular area that has been least examined for its potential for sustainability-based social learning in RCEGS is the collaborative learning partnership between the business and education sectors. This is against the backdrop that partnership through collaboration is one of the core elements of the RCE. The other less examined aspect is the overall coordination of multi-stakeholder networks and their linkages within or between the focal points of RCEGS by the RCE Steering Committee aimed at realizing a shift in progress due to the learning performance outcomes and, as a result, the creation of a sustainable society in the region. Results of a related study indicated that the degree of sustainability of organizations in the education and business sectors were mixed and hence needed improvement [1]. This study therefore seeks to explore how to bridge the two sectors in the context of meeting the ESD and hence sustainable development goal(s) of the RCE through improving the ESD capacity of youth and company workers in the region using existing structures and tools in both sectors.

3. Methods

The study was conducted within RCEGS in Miyagi Prefecture of the Tohoku region of Japan. Students and teachers were sampled from 15 schools comprising four elementary schools, six junior high schools and five high schools in and around Zao-Shiroishi, Murata, Kakuda City, Natori City and Sendai City using structured questionnaires. The data presented in this paper is part of a study conducted on (1) environmental sustainability knowledge of respondents in schools and businesses, and (2) the sustainability of schools and businesses in RCEGS [1,22,69]. Regarding the figure showing “the most appropriate stage for learning ESD”, additional respondents of 94 company workers from 10 firms were sampled. Preferences for the suggested ESD approaches for implementation in the schools were sought from the respondents. The suggested approaches were categorized as: (a) sustainability awareness creation by the use of the media (internet, newspapers, and voluntary in-school activities); (b) re-oriented field-based and classroom-based sustainability education in the present curriculum; (c) company visits and on-the-job training/internship; and (d) sustainability practices in the school premises and environs. The questionnaire included a list asking students to select three jobs they would like to do in the future. Analyses were done and the statistical representations were mainly descriptive.

4. Results

4.1. Enhancing Capacity at the Grassroots Using ESD-Based Social Learning through Collaboration between the Education and Business Sectors in RCEGS

4.1.1. ESD-Related Activities Students Participated in

Education is considered as one of the primary tools for capacity building in most national policy strategies to achieve sustainability. It is therefore important that sectoral education initiatives and programs of RCEs be more closely linked to national sustainability goals and priorities. Table 1 is a list of several pro-sustainability activities that students said they participated in. The idea was to ascertain which activity students already engaged in and hence might have some knowledge of and/or experience in. Consequently, students and their teachers could then be asked to suggest which approach they considered more effective in delivering ESD. Such information on grassroots ESD activities can be useful for curriculum developers or policy makers for possible incorporation into the formal curriculum in the future. It also provides some basic but useful information, particularly for school management and teachers about the level of students' experience in ESD activities in the area for its subsequent implementation.

Results showed significant engagement in sustainability practices in the school environs, engagement with nature and the use of computers to access environmental sustainability information. The number of visits by students to companies to learn about their operations was low and doing internships in environmental sustainability in the company was much lower. This suggests little engagement between the two sectors and as a result, the need to enhance this business-school relationship.

Table 1. Activities students participated in for environmental sustainability-related education or ESD (%).

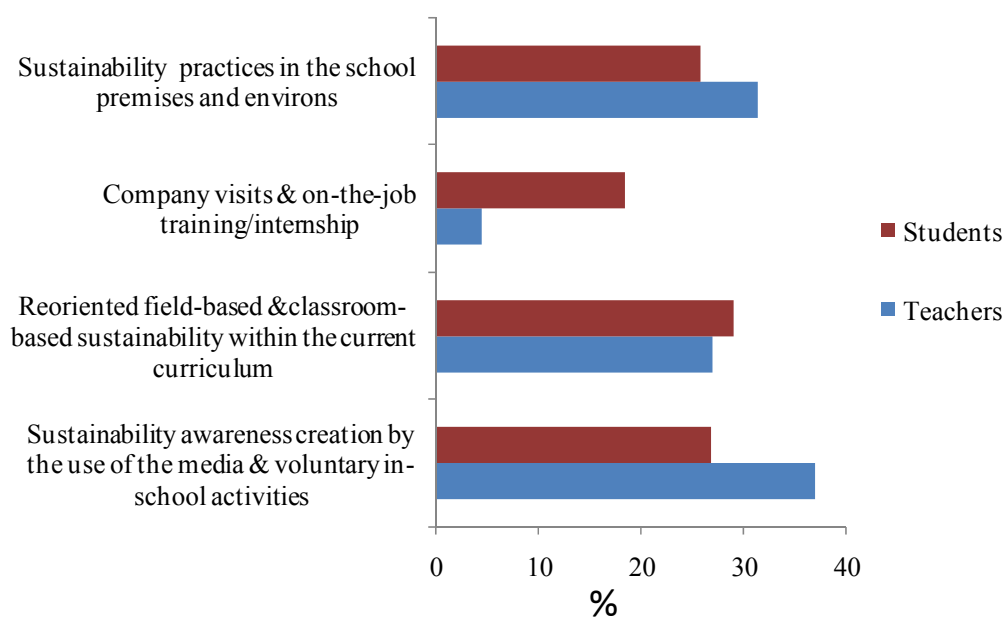
Activity	Students (n = 316)
(a) Visiting nature conservation museums	32.0
(b) Preservation of local natural areas	37.7
(c) Classroom-based school activity related to environmental sustainability	27.5
(d) Participation in environmental club or other voluntary activities	4.2
(e) Visit to a company to learn about its entire operations	14.9
(f) Receiving short-term on-the-job training in environmental sustainability related to the company	3.5
(g) Use of computers and the internet to learn and share environmental sustainability information	32.0
(h) Engaging in sustainable practices in your school (e.g., separating garbage for recycling, water & energy reduction, cleaning the school and its environs)	62.0
(i) Use of festivals, fairs, drama, documentaries, movies, <i>etc.</i> to develop sustainability awareness and knowledge	19.6

4.1.2. Company Visits and On-the-job Training (Internship) as Opportunities for Social Learning

Figure 1 shows that students' and teachers' preferences for the suggested ESD approaches were different. Although company visits by students and an on-the-job training or internship approach was

the least preferred for both groups, students were more eager to engage in this collaboration than their teachers. The two or three day on-the-job training or internship—locally known as *shokuba taiken* and *shokugyo taiken* for junior high and senior high schools respectively—is an annual requirement for students in the second grade of both levels of school. Usually with the guidance of the teacher, students freely choose a local workplace they would like to do their internship and “apply” directly on the telephone. The workplaces usually differ widely—from public institutions to private companies. Elementary school children usually pay brief visits (called *shigoto taiken* in Japanese) to such places.

Figure 1. Respondents’ preferences for the suggested ESD approaches in schools.



Company visits and *shokuba/shokugyo/shigoto taiken* are component activities of “Period of Integrated Study” (PIS) or *Sogotekina Gakushu no Jikan* (in Japanese). It is a national education policy which is mandatory in all elementary, junior high and high schools. It is supposed to cover about 100 hours per year of the school calendar or a study period of 2–3 hours a week and was introduced into the curriculum of schools in 2002. The main objective is to raise the skills of students to solve problems they might face in the future by adopting participatory approaches to learning. It is to provide students with a comprehensive, interdisciplinary perspective on international understanding, information technology, environment, welfare, health and human rights [70]. The important aspects of PIS include the following: (i) teachers have to play a role as facilitators; (ii) they must acquire information about human resources in which local persons can be made use of as guest teachers from the local communities; (iii) students must go to the community outside of school to discover methods to solve problems, and (iv) schools should partner with communities and enhance their ties through PIS [70]. The main obstacle is the lack of any concrete guidelines on what to include and how to operate, *etc.* The advantage, however, is the flexibility it gives the school authorities and teachers to be creative and innovate within the curriculum.

The component activities within PIS, particularly company visits and internships need to be streamlined to maximize the impact of the collaboration. The streamlining could be done at the school

level by the school authorities, or better still with backing from the prefectural/ local school board of education for legitimacy and wider implementation.

The need for collaboration between the business and education sectors is further evidenced by the results of students' preferences for jobs they would like to do in the future as shown in Figure 2. For all school levels, the order of preference for the top three jobs was generally similar: service, information technology and manufacturing (also biosciences for elementary schools). The service sector, particularly food and retail and hospitality sub-sectors, leave significant impacts on the environment. Furthermore, although some operational impacts of some companies on the environment are more than others, their interconnections—e.g., a bank providing loan for a manufacturing company without the appropriate environmental impact assessment plan for its operations—make all the actors involved in the endeavor/project in part equally liable for what happens in the production chain.

Although this relationship between businesses and schools where students do internships and visit companies and other businesses already existed before the advent of ESD, redefining the aims of the collaboration and re-orienting the content, methods and activities towards ESD will be appropriate. For effective collaboration between these two sectors the larger goals of sustainability in RCEGS must be perceived by both sectors.

Figure 2. Business sectors in which students wish to work in the future (Senior high school, n = 126; Junior high school, n = 144; Elementary school, n = 78).

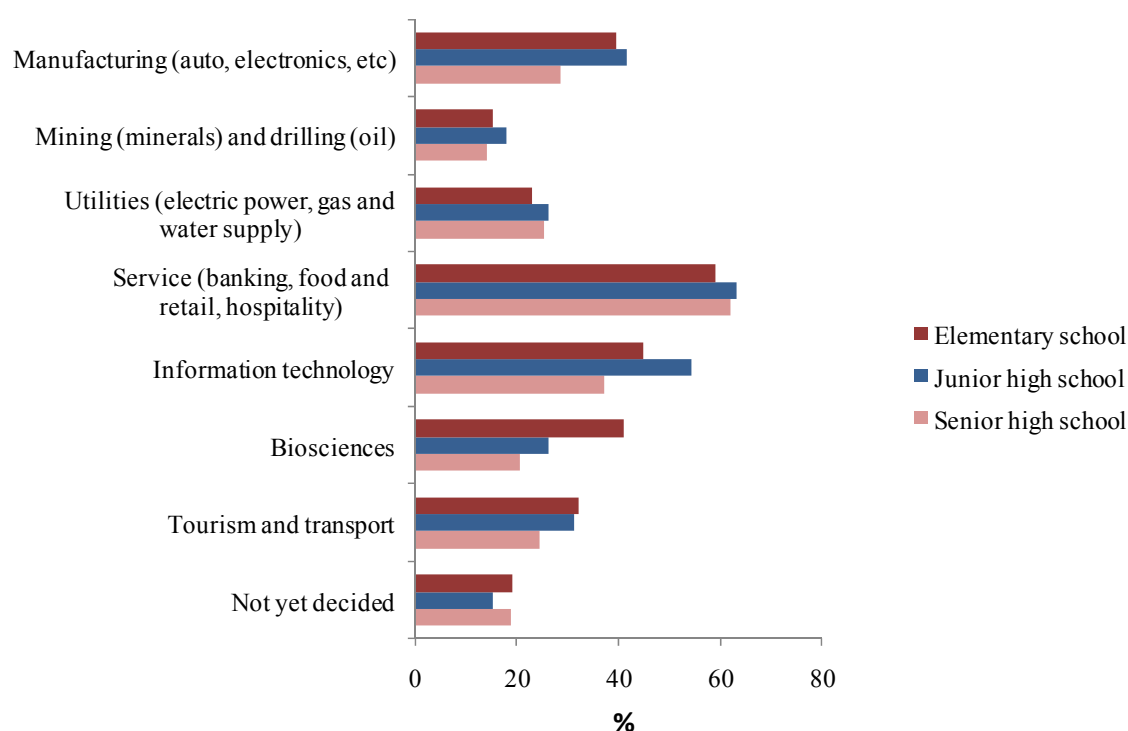
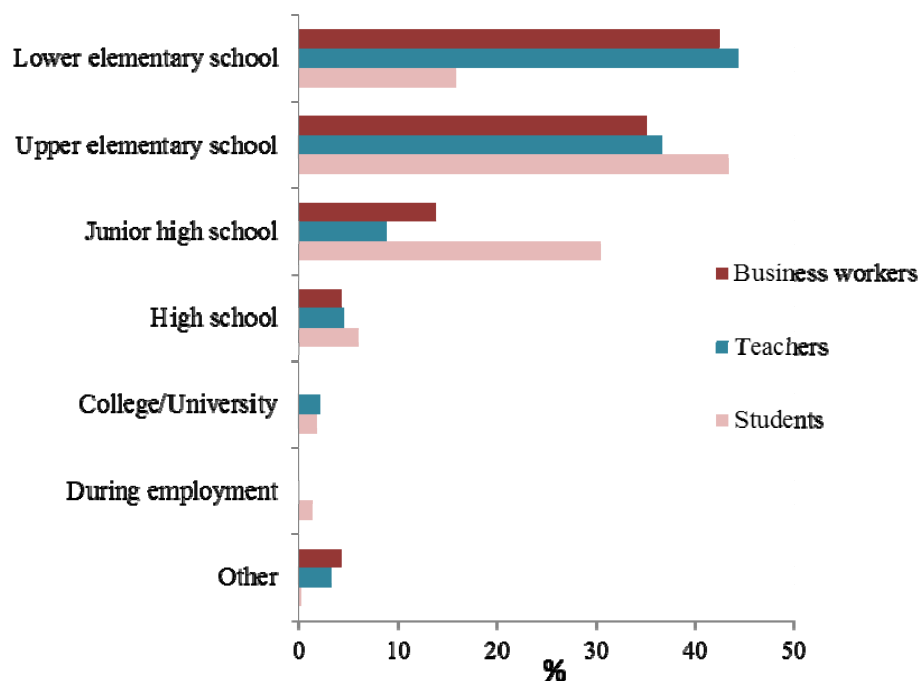


Figure 3 is the summary of the respondents' views on the most appropriate stage for learning ESD. High school and university stages were considered too late. The result indicates an opportunity to enhance ESD capacity building, especially at the lower secondary school level and even further down the educational ladder.

Figure 3. Respondents' views on the most appropriate learning stages for ESD in schools (94 business workers, 94 teachers and 371 students).



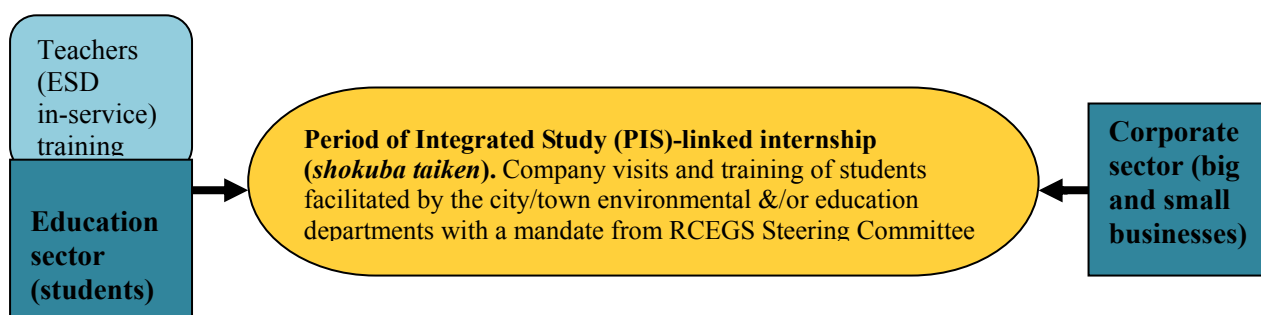
5. Discussion

5.1. The ESD Structure/Context, Processes and Outcome(s) in RCEGS

Based on Figures 1–3, students in elementary, junior high and high schools in general are potentially good targets for ESD capacity building through collaborative learning partnerships with the business sector. ESDBSL processes between schools and companies have business-school collaborative partnerships with both cognitive and experiential learning at the center (Figure 4). It might involve sharing the company's current pro-sustainability strategies, processes and systems of operation as well as unsustainable aspects with the students during company visits/internships. The firms can also provide study materials and other incentives, such as giving prizes and/or awards for pro-sustainability activities and behaviors in the schools. In addition, business can offer reverse visits using company resource persons as guest teachers on sustainability/environmental topics, such as energy, lean production and sustainable consumption, the green economy, *etc.* to students in the schools. They can also introduce to the students some Japanese production philosophy and workplace ethics like *kyosei*, *keiretsu*, *muda*, *kanban* and *kaizen* [22,44] which became popular in the corporate world globally, particularly at the peak of Japan's economic development. Considering the current generation of children and youth as the future custodians of the environment as well as future managers and employees of such companies, businesses need to adjust particularly their CSR objectives to the recent introduction/changes made in the school curriculum. As a result, they should provide the students with relevant sustainability-related training and related materials—not only with the intentions of boosting their corporate image and providing a form of sales promotion [63]. The business sector will thus be better placed to foresee the future of their industry in relation to the environment and affect policy, particularly by contributing to the environmental sustainability

curriculum development and training/teaching of students. Students, some of whose parents work in these companies, can impact the business workers through interactions and especially by asking pertinent and sometimes uncomfortable questions to set them (the adults) thinking. With close collaboration with and approval from the RCEGS Steering Committee, this program activity could be facilitated by the city or town environment and education departments.

Figure 4. The business-school collaborative (cognitive and experiential) learning partnership.



Note: The horizontal black arrows in the opposite directions depict students' cognitive and experiential learning (from company workers) on the one hand, and on the other, workers learning cooperatively through interaction/questioning with students.

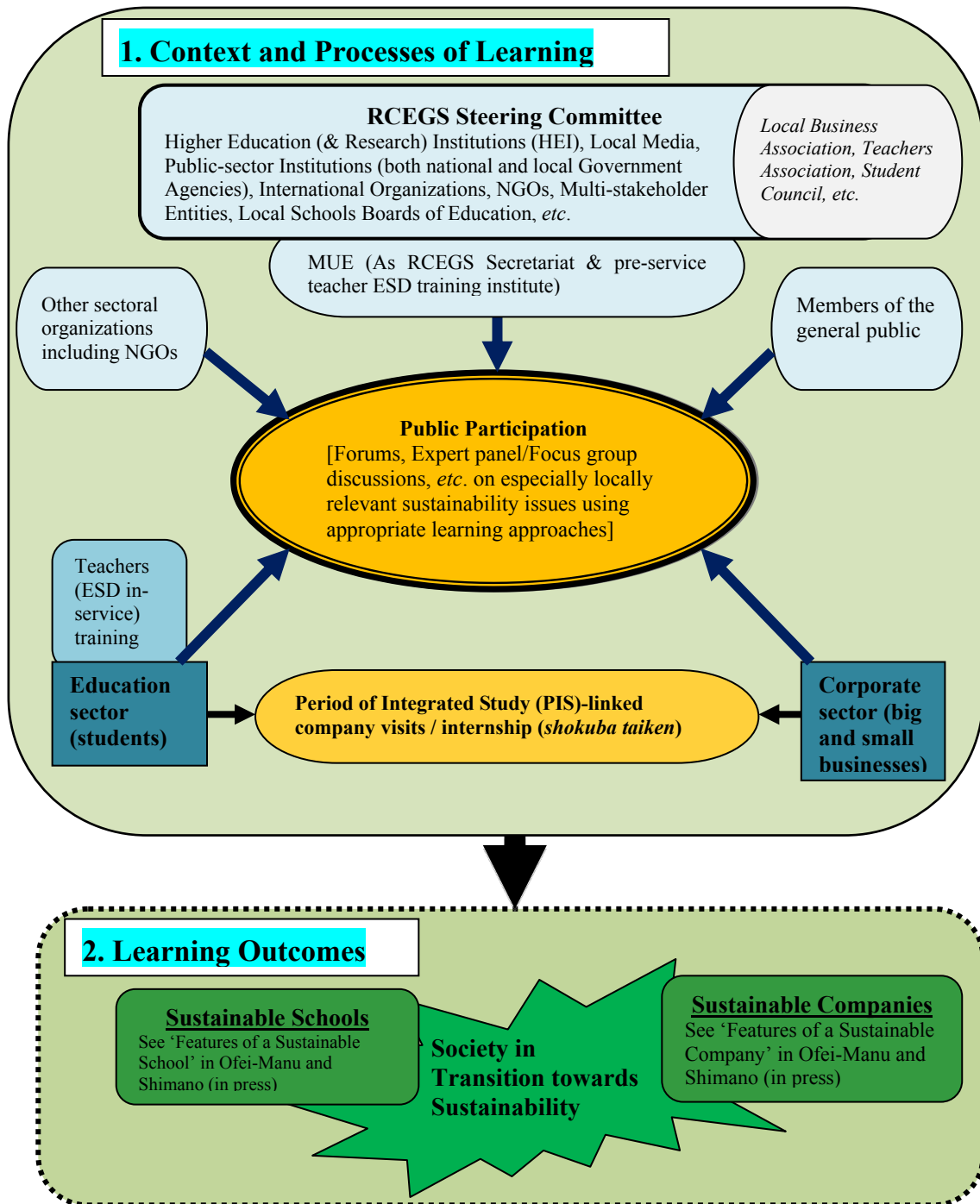
Figure 5 represents a conceptual framework for ESD-based social learning showing how the education and business sectors are linked to the other sectoral stakeholders and actors and the general public through public participation (PP) in RCEGS. It comprises: (1) The context of a sustainability transition through networking and linkages of the multi-stakeholders/actors, including the general public, and facilitated by the governing body (Steering Committee); (2) Use and improvement of the existing learning structures through collaborative (cooperative) and experiential learning, first between the two sectors and simultaneously, with the other sectors of RCEGS; (3) Learning processes enabled by interrelationships and interactions among the actors/stakeholders, and finally, a sustainability (learning) outcome(s). The Steering Committee, whose secretariat is in MUE, is mandated to oversee the program activities within RCEGS. Currently, it includes the following: (1) Higher education institutions (Miyagi University of Education UNU-RCE Promotion Committee, Miyagi University of Education Environmental Education Centre (EEC)); (2) Local Media (*Kahoku Shimpō* (local newspaper)); (3) Public-sector Institutions (National and local government agencies, Tohoku Office of Japan International Co-operation Agency (JICA), Tohoku Office of the Ministry of the Environment, Environment Bureau of Sendai City, Environmental Policy Division of Miyagi Prefecture, City of Kesennuma (Environment and Health Division), Tajiri Town Office); (4) International Organization (UNU-IAS); (5) NGOs (Tohoku Global Seminar, Japanese Association for Wild Geese Protection (JAWGP)); (6) Multi-stakeholder Entities (Forum for Environmental Education and Learning in Sendai, City of Trees ("FEEL Sendai")); and (7) Local Schools and Boards of Education (Kesennuma Omose Elementary School, Kesennuma City Board of Education, and Tajiri High School) [71].

Multi-stakeholder partnerships have the potential to address existing participation and learning gaps as well as harness the strengths of private and public partners [42]. Through multi-stakeholder public participation in the form of forums, expert panel discussions, symposiums, lectures, focus group discussions, study groups, fairs, festivals, camping trips, *etc.* (Figure 5), members of the public and

those from the remaining sectoral organizations can participate through interacting with one another and developing relationships. Public participation (PP) has been used as a tool for the social learning process and as a platform for communication to create awareness among participating stakeholders in different contexts of environmental issues, including that of resource use. Public participation is also considered as a form of learning where there is interaction of multiple processes at different scales of action [72]. For example, (1) Experts from the local universities and research institutions and NGOs in RCEGS can be solicited to offer their expertise on such a platform; (2) Contributions from local/traditional knowledge experts will also be important; (3) Other actors and stakeholders including local media can help disseminate the knowledge created; (4) National and local public-sector institutions and government agencies can offer the needed logistics and mandate from the policy point of view; (5) International organizations present in the region can connect the local activities/programs to those at the regional/global level; and (6) Local school boards of education can provide the necessary mandate for ESD implementation at the local level. Examples of locally-relevant sustainability topics for public discussion include climate change, disaster risk reduction and socio-ecological resilience, particularly at the wake of the triple natural and human-linked disaster that struck the region just over a year ago on 11 March 2011, air and soil pollution, ocean acidification and contamination, sustainable urbanization, values, skills and actionable knowledge to sustain the ecosystems, food and water security, the steady-state economy, sustainable production and consumption, cultural diversity, health promotion, peace and human security, governance and justice (human rights, fair trade, *etc.*), gender/minority equity, cultural diversity and international and regional cooperation (Figure 5).

Identifiable learning processes of the multi-stakeholder collaboration between the business and education sectors and also those involving PP of the remaining sectors in RCEGS include awareness creation, knowledge production that involves iterative interaction, *i.e.*, exchanges involving collaborative deconstruction, reconstruction and co-construction of knowledge along with several types of learning, including experiential and cognitive learning, cooperative and collaborative learning, adaptive learning and co-management [29,30]. The type of learning used and knowledge produced will also depend on the issue under discussion/deliberation. The effectiveness of such learning partnerships is usually shaped by the extent to which all stakeholders are involved in the learning process and the extent to which benefits of the interrelationships and interactions are delivered for all stakeholders [73]. There will be opportunities for questioning during the interactions (e.g., product impact on the environment) and the provision of an explanation or seeking of clarification from the corporate sector regarding a product or service and *vice versa*. Having education and training as an important aspect of its management portfolio, regardless of its motivation, a corporation has to organize, structure and embed sustainability-related actions into its management systems, namely activities, strategies and routines. It should be acknowledged that companies in the region have of late been present in several public activities, particularly fairs organized under the auspices of RCEGS and/or the Environmental Bureau of Sendai City. Since aspects that converge to make the notion of sustainable development useful and operational to most stakeholders include the active involvement of business and the understanding and support that public stakeholders give [74], this collaboration could be used as the beginning to develop the needed partnership between business and RCEGS.

Figure 5. A conceptual framework for ESD-based social learning involving the education and business sectors, other sectors and stakeholders/actors in RCE Greater Sendai.



Note: It comprises: (1) The context of sustainable transition to be facilitated by the Steering Committee; (2) Sustainability learning structures, contexts and processes “activated” by interactions and cooperative learning interrelationships (stakeholder participation, partnerships, collaboration, co-production and sharing of knowledge, *etc.*) among the sectoral multi-stakeholders & actors; and (3) The learning outcome(s). The learning outcome(s) might lead to sustainability-literate (competent) individuals/groups with pro-sustainability skills, values and behavior, “sustainable organization(s)” or a “sustainable society” as the ultimate goal. Area “1” indicates the region where the learning context and processes occur and Area “2” indicates the region of learning outcome(s). The blue arrows depict the participation among the actors and stakeholders. The single thick black arrow depicts the outcome(s) of the learning processes which is a society in transition to sustainability.

The RCE platform can be used to begin creating an “equitable partnership between the combined expertise of communities, professions and governments” [75]. A grassroots form of governance through consumer advocacy, “watchdogs” over several local issues, citizen science, *etc.* can emerge.

Promoting public participation through ESDBSL processes can be influenced by many factors that the Steering Committee must consider integrating into the learning process through coordination. They include:

- how the Steering Committee manages boundaries to determine those who are or are not involved in the process;
- the scope of participation of multi-stakeholder partnerships across sectors as the basis of inclusiveness and thus the possibility of overcoming a participation gap;
- the space given to boundary and bridging organizations regarding collaboration to incorporate their particular experiences of the creation of collective action for capacity building to adapt to change;
- effective coordination among team members and the leadership required to steer and coordinate the process and the type of strategies applied in the negotiation process;
- the laid-down rules established to facilitate interactions among the stakeholders;
- the involvement of the stakeholder in the process in terms of role and purpose;
- the structure of the internal capacity for interactions and the space given for democratic deliberations among social networks and in building social capital;
- how the existing culture exerts influence on the way the issues at stake are framed and defined;
- the processes in establishing managing systems of knowledge and making sense of information;
- building trust, caring for one another, nurturing shared commitment and providing the guarantee that the well-being of all stakeholders is taken into consideration;
- and the facilitation and allocation of resources needed to move the process forward [41,42,47,49,60,62,72,76–80].

The outcomes in Figure 5 refer on the one hand to the ability to have implemented measures to deal with sustainability problems, but on the other hand the capacity of the stakeholder group to deal with problems as well. Other outcomes in addition to the overarching outcome of sustainability include: (1) acquisition of actionable knowledge and values to make informed decisions; (2) a genuine participation of stakeholders due to an increased concern for the environment; (3) a sense of inclusiveness and collective ownership of the natural capital and other forms of capital in the region; (4) information flow among stakeholders; (5) the building of relationships and trust between knowledge producers and users; (6) a highly motivated youth who double as future managers of the corporate sector as well as the custodians of a planet whose resources companies depend on; and (7) a sense of self-efficacy of the local people, local authorities and policy makers [30].

Reed *et al.* [55] argued that social learning, stakeholder participation and collaboration have to be considered as different concepts, thus dissenting from several authors cited in their paper. They also pointed out that social learning, though, could be a process or an outcome often mistaken for or defined in relation to its outcomes. They then posited that for a process to be considered social learning, (1) there must be a change in the understanding of the individuals involved; (2) the change must have gone beyond the individual and be embedded within the broader social units or

“communities of practice”; and (3) the process should occur “through social interactions and processes between actors within a social network [23]. The participation of multi-stakeholders/actors from other sectors in RCEGS might help transfer knowledge and skills to other “communities of practice” through ways including job transfers among workers, particularly teachers [30].

5.2. Recommendations

Teachers play a crucial role in students’ learning process [81] and therefore their contribution will determine the eventual success of ESD. Student teachers in Miyagi University of Education for example are currently receiving ESD training both on campus [82] and in the field [30], although the content and structure ought to be streamlined. Provision of in-service ESD training to teachers is also important, as a report indicated [69] that 67.0% of the teachers within RCEGS did not even know that a teachers’ resource center for environmental education existed in Miyagi University of Education. Also, the interest of teachers in students’ company visits/internships is key to the success of the collaboration, and therefore ought to be enhanced. In an earlier report regarding which seven activities teachers and students considered the most effective in implementing ESD in RCEGS, for teachers “company visits/internships” came next to last while for students, it came a close third after “field-based school curriculum” and “engaging in sustainable practices in schools” [69].

Presently, the support offered by the media to RCEGS to attain its DESD goals needs significant strengthening. Currently, only one newspaper has committed itself to the ESD cause in the region since RCEGS was inaugurated more than seven years ago. The level of awareness of RCEGS in the region is also only satisfactory and RCEGS should do more to communicate its existence and activities to the general public. A survey in 2006 [69] on awareness of RCEGS among respondents in the education and corporate sectors was significantly low. Another survey made three years later (unpublished) in similar locations showed little progress.

The governance structure and the constituent members of RCEGS Steering Committee should strongly influence the type of multi-stakeholder cooperation and ESD-based collaborative learning processes in the region. For example, its role as the governing authority and therefore taking local ownership of the ESD concept and its implementation, in consultation with the local/municipal authorities is important. When it comes to implementing ESD especially in schools, it should try to eschew or discourage invisible competition [83] between the education and the environmental ministries, and also between the environmental bureaus of cities and towns and their corresponding boards of education. The influence of bureaucratic systems, and poor access to public information which can be obstacles towards social learning [76,77,84] should be drastically reduced. Furthermore, in spite of the considerably strong representation in the economy and other aspects in the locality, the business community is visibly not represented on the Steering Committee of RCEGS (Figure 5). Also, teachers primary and secondary schools are not “independently” represented by say, the teachers union/association. And students are not represented as well, even though there are student councils in all the schools researched. This issue of representation should be addressed.

At the national level, Japan has been a leading global funder and supporter of (D)ESD programs from the beginning. Its national ESD strategy is in place, and according to the UNDESJ Japan Report on Japan’s effort from the beginning of the UN Decade of ESD to 2009, an ESD implementation

system has been established, comprising 11 ministries and agencies, a representation from the legislature and a consortium of NGOs. Also, the Japanese government, based on its Action Plan, has been coordinating discussions on the measures for implementing ESD by holding interagency meetings as a medium for exchanging opinions among policy makers consisting of politicians, academic experts, educators, representatives from NPOs and business [85]. Furthermore, one of the goals for the second half of the Decade includes the following:

“Fostering Closer Alliances, The government will promote ESD in primary and secondary schools and introduce it into teacher training courses and training programs for teachers when they renew teaching licenses. It will also take steps to promote joint community-school ESD initiatives, including school and community support headquarters and stakeholder conferences.” “At the community level, the government will support partnerships among and initiatives by individuals and organizations in the community, such as forums to promote ESD. It will also bolster ESD programs as well as the ESD promotion mechanism in public halls, civic centers, children’s centers, libraries, museums, and other social education facilities. Steps will be taken to train and deploy coordinators to promote ESD in the community” [85] (pp. 19–20).

In relation to the above, the education-business ESD collaborative partnership can be streamlined and brought to the mainstream by strengthening it at the national (policy) level. The PIS, although government-mandated, is flexible and the choice of activities including company visits and internships mainly depend on the school or local boards of education. Here, the ESD-related agencies at the national level (like ESD-J, a consortium of NGOs in Japan and the United Nations University, the originator of the RCE concept which also serves as the secretariat of RCEs worldwide) and those organizations at the local level can “lobby” the relevant authorities for priority and more time to be given to the ESD-related activities in the PIS. A report by Ofei-Manu and Skerratt [69] showed that only 41% of students responded in the affirmative when asked whether PIS discussed sustainability/environmental issues adequately. This business-school partnership should also be considered in the government’s public-private partnership (PPP) programs.

6. Conclusions

Companies and schools, while underpinned by different philosophies, are inherently linked by the human factor. In other words, peoples’ attitudes towards capacity building through continuous learning and application of the acquired knowledge backed by appropriate values will eventually determine the sustainability of a company, a school, and ultimately society.

This study discussed some of the sustainability challenges facing the business and education sectors and tried to explore ways that business can actively contribute to ESD implementation at the local level with the focus on youth. One way is improving the local partnership, which business already enjoys with the education sector but is currently ineffective, by enhancing ESD-based learning through collaboration with schools. Business can make use of the government-mandated PIS curriculum by partnering with schools to offer training/teaching and provide logistics to help develop the ESD capacity of the students. It will be the right thing to do to since it will help ensure businesses’ own survival by building ESD capacity of the youth who will potentially run these companies in the future.

In doing so, business will honor one of its CSR obligations and at the same time boost its public image. The partnership will also make a positive impact on the students' attitude, behavior and performance. The business-school partnership could be advanced further into a business-school (community)-university partnership within RCEGS to provide a more comprehensive linkage and context towards the training and education of the youth for the future. Furthermore, the impact of the business-school partnership can be a significant contributor to capacity building of Japanese youth if the process is repeated round the country or at least within all the six RCEs that Japan currently boasts.

The study also examined how business can be part of the larger RCEGS multi-stakeholder ESDBSL partnerships through public participation and discourse to help harness and enhance the adaptive capacity of the other stakeholders (and themselves) in RCEGS. There is little collaboration between RCEGS and business so far, and corporate support for RCEs, particularly funding, has generally been weak. This learning collaboration, if successful, is capable of being self-sustaining as the firms can provide the necessary funds, logistics and to some extent expertise. Given the current poor funding and hence the relatively weak financial standing of RCEs in general, this development will be good.

Considering its role as a major implementer of ESD at the grassroots that is locally and culturally relevant, the RCE is becoming increasingly important for the success of ESD implementation, and hence the sustainability concept globally. The realization of this important role will, however, be dependent on funding, adequate and capable full-time ESD personnel and effective collaboration and networking among the RCEs across scales. It is hoped that through the process of ESDBSL, citizens will acquire the competencies they need in order to secure their roles as positive, productive members of society, thus fulfilling the main objective of ESD. In the end, the community is empowered as it strives to transition into a sustainable society.

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Conflict of Interest

The authors declare no conflict of interest.

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