REVIEW

Educational Benefits of Waterside Nature Experiences and Ocean Education

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1. Introduction

The United Nations Convention on the Law of the Sea, which came into force in 1994, divided the world’s waters into internal and territorial waters, contiguous zones, exclusive economic zones, and international waters, all of which have different legal characteristics. In addition, it set out a system defining the continental shelf and the deep seabed.

Of equal significance from an international standpoint are the Rio Declaration on Environment and Development and the action plan to implement it known as Agenda 21. The Rio Declaration, which incorporates the principle of sustainable development, was put forward at the 1992 Earth Summit. Agenda 21 calls on countries to develop initiatives that promote the introduction of marine environmental protection topics into the curriculum of marine studies programs, from the perspective of education and supporting professionals to manage the oceans.

Following on from this, Japan enacted the Basic Act on Ocean Policy in 2007, and the Basic Plan on Ocean Policy in 2008. These developments emphasize the need for management policies that keep human activities within the realm of the ocean’s capacity, and also make the point that sustainable development and use of the ocean are now established by law and international treaty, thus marking the arrival of a new age of comprehensive ocean management.

The Basic Act on Ocean Policy makes special mention of measures relating to ocean-related education. Article 28, entitled “Enhancement of Citizen’s Understanding of the Oceans, etc.,” states that “necessary measures” are to be taken “to promote school education and social education with regard to the oceans.” In the Basic Plan on Ocean Policy, which was established in response to the Basic Act, Chapter 2 (“Measures that the Government Should Take Comprehensively and Systematically with Regard to the Sea”) Section 12 (“Enhancement of Citizen’s Understanding of the Sea and Fostering of Human Resources”) states, “Efforts should be made to ensure that marine-related education is provided properly in social studies and science classes at elementary schools, junior high schools and high schools, and to disseminate marine education through introducing practical cases relating to the sea.”

The section further states, “The government should also provide support for educational activities aimed at teaching citizens basic knowledge about the sea, and the various problems concerning the sea, by promoting ecotourism and experience-oriented activities at fishing villages, and should also promote efforts that employ natural science museums, including aquariums.” In addition, the Secretariat of Headquarters for Ocean Policy formulated the Basic Plan on Ocean Policy for Children, which is intended for use in educational settings, as an initiative for enhancing citizens’ understanding of the ocean as well as supporting professionals.

Furthermore, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) announced revisions to government-issued junior high school curriculum guidelines aimed at enhancing the content of educational activities relating to the ocean. The revisions include emphasizing Japan’s particular characteristic as a maritime nation in social studies classes, and enhancing the curriculum in areas related to atmospheric movements and their effect on the ocean in science classes.

In his discussion on the history of marine education, Nakatani²³ stated that since the Meiji Period (1868–1912) marine education was education about the ocean itself, as well as education that took the ocean as its base, as typified by merchant shipping education (ships), fisheries education (marine products), and education relating to the maritime security and self-defense. Nakatani also noted that marine education had come to include education on merchant shipping, fisheries, the maritime security, radio communication, and self-defense since the Meiji period.

In his work, Suehara³ noted the marine education carried out at Japanese secondary and higher education institutions was aimed at occupational areas that are under the jurisdiction of different ministries and government offices, and that primary education institutions have had few opportunities to consider the ocean. Furthermore, he pointed out that there had been no comprehensive marine education policy for teaching about the ocean from an overall perspective, and that there was not even a legally recognized term for marine education.

Despite this, in recent years, organizations bearing the name “marine education” have been established within a
number of universities and scientific forums, and marine education has come to be seen as education aimed at increasing familiarity with, learning about, and furthering understanding of and interest in the ocean. A report by the Ocean Policy Research Foundation defines marine education as “education that furthers people’s understanding of the relationship between humans and the ocean, and which aims at developing human resources with the knowledge, skills, cognitive ability, judgment, and power of expression that will enable them to work for marine environmental conservations, as well as to carry out peaceful and sustainable development and use of the ocean that is grounded on international understanding.”

The report regards this concept as learning in which students “become familiar with, know about, protect, and use the ocean.” It explains that learning designed to familiarize students with the ocean involves various different experience-based activities within the rich natural environment of the ocean and within the local community. These activities have the specific objective of cultivating fertile sensitivity and interest toward the ocean, while simultaneously fostering children and students love for the ocean and will enthusiastically work to bond with it. Thus, it can be seen that educational programs related to the ocean of the past, which aimed primarily at developing professionals, have since expanded to become marine education with a much broader scope and which is now aimed at a wider range of students.

The first report of “The Model for Japanese Education in the Perspective of the 21st Century” (15th Central Council for Education) stated that the qualities and capacities that children need in the current period of rapid change are “competences for positive living,” or “zest for living.”

The report set out a fundamental policy of focused development for three areas of ability. The first of these was the ability to identify problems by oneself, study by oneself, think for oneself, exercise judgment and act independently, and to solve problems effectively no matter what changes occur in society. The second was aimed at nurturing an abundant sense of humanity, including self-control, cooperation with others, a spirit of caring for others, and a capacity to be moved emotionally. The third area was developing the health and strength to live a robust life.

The report also called for increasing opportunities for young people to experience everyday life and nature more fully. Previously, outdoor activities in school education such as forest school, seaside school, camping, or mountain climbing have emphasized physical behavior or physical educational activities. However, there is a greater expectation today for experience-oriented activities that take place in natural surroundings aimed at providing opportunities for children to experience everyday life and nature in ways that nurture their zest for living.

Nature appreciation activities are described in the government curriculum guidelines. With regard to their content, the government curriculum guidelines for elementary schools state that “attention should be paid to giving proactive guidance during activities such as playing in the snow, playing on ice, skiing, ice skating, or waterfront activities that are intimately connected to nature, taking into consideration the region and characteristics of the school.” Likewise, the guidelines for junior high schools call for “proactive guidance during activities such as skiing, ice skating, or waterfront activities.”

The Japanese term for waterfront activities is derived from the English, and in its narrowest sense, it is used as a general term to cover marine sports such as canoeing. However, in a broader sense it is a much more comprehensive term, covering outdoor activities carried out using the environment in the vicinity of water that place value on elements such as one’s companions or nature.

The MEXT report “Enhancing Outdoor Education for Young People” stated that it was essential to expand outdoor education, or nature appreciation activities that might be regarded as education. Outdoor education is a general term for “nature appreciation activities carried out in an organized and systematic fashion within the natural environment, with a certain educational objective.” The report stated that outdoor education for young people supported their intellectual, physical, and emotional growth. In other words, their holistic growth.

During his pioneering work with the National Council of YMCA of Japan, Sakai was a driving force for waterfront activities in Japan, and pointed to five merits related to such activities. The first is that they awaken a proper recognition and deep understanding of the nature of the ocean. The second is that they teach above safety. The third is that they give pleasure and excitement as one appreciates one’s own achievements. The fourth merit is that they promote enthusiastic efforts toward learning about the ocean, and through this encourage young people to become interested in, motivated towards, and participate in conservation and ocean environment protection activities, and thus become active advocates and leaders in caring for the ocean. The fifth merit is that they stimulate young people to comprehend compliance with rules in a completely natural and straightforward way. Sakai also noted that the physical fitness and psychological benefits of sporting activities could not be overlooked, and pointed out that waterfront activities often provided therapeutic benefits.

Other work relating to nature appreciation activities at the waterfront includes a practical report by Jack T. Moyer et al. Moyer explained the importance of turning our attention to the ocean, which was infinitely precious, and stated that having an interest in the ocean was a paramount first step toward protecting it and using it sustainably. He also stressed that the basis of experiencing nature was for individual students to go out into the field and discover things first hand, which gives them the impetus to come into contact with academic knowledge. Furthermore, Rachel Carson noted that simply standing at the waterfront to become acquainted with the ocean could allow people to gain a real understanding of the ocean. Thus, we can appreciate how the pioneering naturalists believed that it
was important for people to see with their own eyes, feel with their hearts, and think for themselves through direct physical experience.

So far, we have seen how there have been two factors in the social background to waterfront activities. The first is that, stimulated by a growing international consensus, the importance of increasing the understanding of the Japanese people with respect to the oceans has been enshrined in laws and plans established from the perspective of comprehensive ocean management, so that the scope of education relating to the ocean has expanded. The second is that the basic policy of increasing young people’s zest for living recognizes the need for genuine experiences.

Thus, there has been increasing awareness of the need to enhance marine education and nature appreciation activities that make use of the waterfront. Despite this, however, it has been pointed out that there is still little in the way of government curriculum guidelines relating to the ocean, and that the excessive workload teachers already face means that they have not been able to take on marine education as well[15]. Additionally, it has been noted that issues such as time availability, safety management, and problems in securing locations and training personnel are specific obstacles to implementing waterfront activities. There is also the problem that it can be difficult to convince people to take on activities in which someone has to be directly accountable for student care and custody[16].

The present study aims to review the past and current literature on studies of the results of waterfront nature appreciation activities and marine education, in order to investigate their educational effectiveness and to clarify issues for future study. This is expected to yield basic data that will be useful for the development and research of marine education and nature appreciation programs that use the waterfront, for which there is expected to be an increasing need in the future.

II Trends in research into the effects of waterfront nature appreciation activities and marine education
1. Effect on zest for living

To clarify the indices comprising zest for living, Tachibana et al. [15] conducted a survey of 211 schoolteachers and outdoor teachers. The researchers first collected words that could be considered to encompass the idea of “zest for living” after which the discriminative power and validity of the words were examined by 350 evaluators. Clusters of words encompassing “zest for living” were assembled into indices to which names were then assigned. The researchers concluded that “zest for living” was comprised primarily of psychological and social ability, moral educational ability, and physical ability.

Tachibana et al. then developed the Ikiru Chikara (IKR) inventory (Ikiru chikara is the Japanese language translation for “zest for living”), as a way to measure the concept. The inventory is divided into 14 subfactors, each sub-divided into five items, for a total of 70 items. For each item, there is a six-step rating scale ranging from “Completely agree” to “Completely disagree” which allows respondents to record their own responses. Since its creation, the IKR inventory has been used in a variety of outdoor education studies as part of efforts to clarify the effects of outdoor education on “zest for living.” A shortened form, with carefully selected items, has recently come into use.

Aoki et al. [16] used the 70-item IKR inventory in a study of 267 elementary school students who took part in the Japanese version of the School Water Wise program, which was hosted by the National Muroto Youth Outdoor Learning Center. The researchers evaluated the effect of the program on the participants and found that the program increased almost all “zest for living” indices with the exception of physical stamina. Aoki et al. also noted that even a short-term program increased the levels of “zest for living.”

Fukuda[17] investigated changes in “zest for living” in residential programs from various different viewpoints, and found no differences due to sex, school type (elementary or junior high), or number of days in residence. However, they did report differences depending on whether the children came from schools in mountainous regions or schools in urban regions. This suggests that the zest for living of program participants may change in different ways depending on where they usually live and their personal experiences with nature during the course of their everyday lives.

Yamashita[18] investigated the effect of an open water scuba diving course that was taken as part of university coursework on “zest for living” and found significant increases in all three main indices of psychological and social ability, moral educational ability, and physical ability. Thus, he concluded that the course was effective in increasing “zest for living” among participants. Yano[19] observed 317 elementary school students from fourth to sixth grade who took part in a residential seaside school for four nights and five days and found a marked increase in the children’s “zest for living” a month and a half after the seaside school had finished.

Taking a general view of all of these studies, it can be seen that their methodology was to use the IKR inventory developed by Tachibana et al. with the program treated as an experimental intervention. However, none of these studies had a control group in the strict sense, which can be identified as a weakness in the experimental design. Furthermore, it should also be noted that with the exception of the study by Yamashita, these were large-scale studies that covered numerous topics, which tended to amplify the effects of small differences.

2. Seamanship training

The Sailing Dictionary[20] defines seamanship as “a term covering all the skills and abilities that are linked to experience and knowledge of piloting, repairing, maintenance, navigation, and weather, and to proper knowledge of maritime rules and conventions, and which allow instant response to any conditions that might be encountered at sea.” Likewise, John Rousmaniere[21] defines seamanship as “the skills that enable a person to navigate,
handle, and maintain a ship or boat anywhere and under any conditions. Furthermore, he states, "In the broad sense, it is enjoying boats and using them safely under all types of condition and in all weather."

The Education and Training Committee of the Japan Yacht Association (now the Japan Sailing Federation) published *Seamanship Training for Yachtsmen*, in which it was stated that seamanship is the "nature of a mariner, it is the mariner's skill, ability, and occupation."

Studies with seamanship as the keyword include Ueno *et al.*, who carried out intensive classes on yachting and evaluated them; Shimizu *et al.*, who evaluated rowing old-style Japanese boats; and Kusaka, who studied the difference between the regular business of sailors and good seamanship. In their appraisal of the ways historically sailors were educated, Suzuki *et al.* treated seamanship as a capability that combined awareness and ability. They note that when educating Japanese sailors, seamanship commences with instruction in piloting skills for Western-type ships, and at the same time includes the importance of self-awareness, which is also an aspect of seamanship.

Morishita distributed a self-administered questionnaire to 40 trainee sailors and analyzed the results using the KJ method in order to clarify the semantic structure of seamanship. The results show that seamanship, as understood by the trainees, could be classified into 11 categories that make up the four major groups of: "comprehensive understanding of the term itself," "images and terms associated with the words 'ship,' 'ocean,' and 'sailor,'" "attitude expected of a sailor," and "growth."

The *Encyclopedia Britannica* described seamanship as "something that is only acquired through practice," and Osugi saw an interesting relationship between this and tacit knowledge. He points out that seamanship takes the form of tacit knowledge that cannot readily be put into words. The term "seamanship" in Japanese is explained as having a comprehensive meaning that includes a substantial meaning of awareness that is not seen in the West. As there has been little work to specifically explain this or to evaluate it, there is a need to build up a body of research in this area.

3. Effect on self-concept, self-efficacy, and emotional intelligence quotient

In a study of 43 cadets at a mercantile marine college, Yamashita *et al.* used the 47-item self-differential scale form to investigate the educational effects of a six-month training voyage. They reported a positive change in many of the items as a result of the voyage. On the other hand, Isayama *et al.* studied 34 participants on a children's cruise that was geared primarily towards recreation using a 21-item inventory of self-growth in order to investigate the effect of the cruise on self-concept. They found that while some aspects of self-concept improved as a result of the recreation cruise, wintertime residential training that included a number of adventure elements resulted in a greater increase in self-concept.

Self-efficacy, which is a core concept in social learning theory and social cognitive theory, is defined as a measure of an individual's ability to effectively accomplish a necessary action in a particular situation. Watakabe *et al.* studied the generalized concept of self-efficacy in regards to 247 people who took part in an ocean appreciation training program and reported an increase in generalized self-efficacy as a result of the ocean appreciation training, with no differences between sexes. Additionally, Kubo *et al.* used a generalized scale to study changes in self-efficacy among 147 fifth grade elementary school students participating in the Japanese Water Wise program and reported an increase in self-efficacy as a result of the program. Ikehata *et al.* used a self-esteem scale to measure the differences before and after seaside training mainly in long-distance swimming. They report that self-esteem increased after the long-distance swimming and suggest a link with physical self-efficacy.

In addition, Shindo *et al.* studied the transitions in yachting self-efficacy, a concept they formulated specifically for yachting scenarios, and the generalized self-efficacy developed by Miyoshi, over a five-day yachting training program. They found no changes in yachting self-efficacy, while generalized self-efficacy increased from the second to the third day but did not change on other days. Additionally, in a recent study into the educational effectiveness of training on a sailing ship, Kunieda *et al.* examined changes in emotional intelligence quotient (EQ) using the Competence Highlighter Easy Quickly (CHEQ) exam, which is a simple test based on EQ. They reported marked increases in traits such as communication (14.5% increase) and ability to think positively (13.8% increase).

The above studies show that, in areas relating to the self, marine training can generally be found to have a positive effect. However, none of these studies had a control group in the strict sense, which can be identified as a weakness in the experimental design. In addition, there has been no investigation to date into the degree to which the educational effects persist.

4. Sociality and communication ability

Yamabe *et al.* carried out a questionnaire survey with 155 trainees in an attempt to understand and analyze awareness of training at marine sports camps, during which the researchers extracted five factors: feeling of achievement/satisfaction, nature, understanding the activities, communication, and guidance. Comparison of the scores for each factor showed that, when engaged in group activities, there were differences in the feeling of achievement/satisfaction and nature factors, which suggested that the trainees may have been affected by the situation particular to the group activities or the weather.

Hirano *et al.* carried out a survey with 70 sailing enthusiasts in order to develop a scale for evaluating communication behavior resulting from sailing. From the results, the researchers drew up a scale of 38 items, which they used to formulate a questionnaire survey given to competitive sailors. From a factor analysis of the data obtained from 192 respondents, they then drew up a
communication behavior scale comprising 26 items relating
to the five factors of harmony, partnership, delivery,
cooperation, and self-expression. Thus, while the
development of sociality or communication ability are
generally described as objectives of marine education
activities, the present situation is that they are no more than
research results that are understood and regarded as factors.

5. Effect on mental health

Watakabe et al.²⁹² investigated the effects of ocean
appreciation learning on mental health by administering the
Diagnostic Inventory of Mental Health Patterns (MHP-1)
test to 100 participants related to a 10-day ocean
appreciation learning program, before and after the program.
The researchers found improved scores for stress level and
purpose in life in the participants group. They examined
factors relating to changes in mental health and found that in
the stress level scores there was a significant correlation
between changes in mental health and “anxiety prior to the
ocean appreciation” and “cognitive evaluation of
participation prior to the ocean appreciation.” This indicates
that people with greater unease and those who were happier
to take part in the ocean appreciation showed greater
improvement in stress level. For the purpose in life scores,
there was a significant correlation between changes in
mental health and “anxiety about the ocean learning
program,” “usefulness in everyday activities,” “amount of
physical activity during the ocean appreciation,” and
“appreciation of social persuasion.”

Furthermore, Watakabe et al.²⁹² studied social skills in 20
elementary school students who took part in a seaside sports
camp to investigate whether different levels of prosocial
skills, introverted behavior, and aggressive behavior affect
changes in mental health resulting from the camp. The
researchers surveyed the children before and after the camp
using the Diagnostic Inventory of Mental Health Patterns for
Children and the Social Skills Inventory for Elementary
School Children. The results showed that although children
with higher social skills showed better mental health in
terms of factors such as motivation and stress reaction, the
sports camp did not bring about any improvement or
elevation in mental health. There are thus inconsistent
results regarding the effect of ocean appreciation training on
mental health.

6. Effect on image of the ocean

Oshima et al.²⁹³ analyzed essays written by university
students after participating in a three-night, four-day
residential marine sports training program in order to
determine the effects of the experience. They reported that
“regardless of whether they started with affirmative or
negative emotions, many of the participants felt that the
inspiration of nature, the physical and psychological
enrichment, and the awareness of reality of the various
ocean experiences brought about changes in their feelings
and thoughts of connection to the location. They assimilated
the experience in their own ways, primarily by becoming
resolved toward environmental protection or attaching
significance to the training.”

Aoki et al.²⁹⁰ reported changes in the awareness that the
ocean was fun, feel good, and its products were delicious,
as results of actually coming into contact with the ocean and
carrying out a variety of ocean appreciation activities. They
suggested that the Water Wise program reduced negative
perceptions of the ocean and increased positive perceptions.
They also reported that the image that children had of the
ocean changes greatly as a result of the Water Wise program,
reporting improvement in the image of the ocean as “fun”
and alleviation of the anxiety or fear that “I might drown.”
Additionally, Aoki et al.²⁹⁰ surveyed 302 elementary school
students who took part in the Japan School Water Wise,
hosted by the National Muroto Youth Outdoor Learning
Center, during which they found that the program had the
educational effects of increasing interest in the ocean among
the children, as well as raising awareness of environmental
and cultural conservation of the ocean, boosting creativity,
and increasing social behavior.

These reports suggest that nature experience activities can
change the participants’ awareness and image of the ocean.

7. Effects on health and strength, including ocean therapy

Studies into the effects of ocean activities on health and
strength, and of ocean therapy, indicate that sunbathing
promotes Vitamin D formation, encourages bone formation,
and contributes to alleviating sleep disorders. In addition,
the effects of ocean water exercise can contribute to improving physical factors for metabolic syndrome
in the middle-aged and elderly, and studies of ocean bathing on atopic dermatitis, a report that floating in seawater has relaxation
effects, and studies of deep ocean water and thalasso
therapy.

Furthermore, ocean therapy or staying in an ocean
environment is reported to have favorable sleep,
psychophysiological, endocrine, and immunological
effects.⁴⁰³

In a psychophysiological study, Okuyama⁴¹ studied the
effects of a one-week stay in an ocean environment on
factors such as sleepiness, mood, and stress on 26 adults
aged 28–62. In his report, he states that while there was an
increase in anxiety regarding the return to normal everyday
life at the end of the stay, improvement was found in levels
of sleepiness, mood, and anxiety during the program itself.
While there are numerous case reports such as this, they are
not limited to cases in which ocean activities have had a
favorable effect on health. There are also reports of injury
due to marine organisms or other incidents.

8. Effect on ocean literacy

While the original meaning of literacy is “ability or
attainment in reading and writing,” ocean literacy is the
“ability for comprehensive understanding of the hydrosphere,
principally the ocean.” In other words, it is the ability to
comprehend the effect of the hydrosphere on us and our
effect on the hydrosphere. In November 2005, the National
Marine Educators Association published a final report
entitled Science Content and Standards for Ocean Literacy: A Report on Ocean Literacy detailing seven essential principles and 44 fundamental concepts that currently define ocean literacy.

In the United States, under the sponsorship of California State University, ocean experience education with a theoretical background of ocean literacy has been ongoing at Camp SEA Lab in the Monterey Bay town of Seaside since 2000, and a report has been made of an evaluation of this education program. The evaluation surveyed approximately 1,000 people who participated in programs hosted by Camp SEA Lab from 2002 to 2006, using a Likert scale and free descriptions before and after the program. Positive changes resulting from the program were reported in the emotional domain, the cognitive domain, and in relation to future careers.[42]

In Japan, the Watanabe Memorial Foundation for the Advancement of Technology[43] has published reports of survey studies and research with the aim of spreading ocean literacy. One such report is an outline of a questionnaire survey by Otobe that found the following to be characteristic of ocean literacy: going to the ocean around elementary school age for ocean bathing, etc. was given as the start of a person's interest in the ocean; ways of obtaining knowledge relating to the sea were from television, aquariums, books, newspapers, and classes; and questions and topics of interest relating to the ocean are mostly about fish and shellfish among elementary and junior high school students, but they become more diverse as the children grow older. Additionally, in considering what should be taught as ocean literacy, Komatsu cites the importance of teaching personal appreciation.

Chishi and Sasaki[44] carried out repeated questionnaire surveys of trainers in fisheries or marine education in order to investigate a specific method for evaluating ocean literacy. They clarified a cluster structure for ocean literacy as seen by the trainers. Using this, Chishi[45] drew up a questionnaire comprising 36 questions for evaluating ocean literacy.

Tomago et al.[46] administered the questionnaire drawn up by Chishi et al. to university students before and after intensive training classes taken as a required subject. The researchers found variations in the pattern of changes in the ocean literacy subscales and note that there were differences in the effects on ocean literacy related to the content of the class. Surveys of ocean literacy have only just started, and there is a need to build up a body of research in this area.

9. Effect on environmental awareness and pro-environmental behavior

Oshima et al.[47] recognized that participants in marine sports training that included canoeing and skin diving obtained greater awareness of marine sports and environmental protection and understanding of local problems after the training. They stated that the activity could function not just as sports training, but also as a platform to learn about various problems such as local marine environmental problems. Okamura et al.[48] developed an integrated educational program comprising environmental education using rivers and adventure education with the aim of cultivating attitudes toward the natural environment. They investigated the effects of this program on participants' attitudes and image with respect to water, finding that emotional attitudes toward water in participants of a camp using the integrated environmental and adventure education program had improved immediately after the program and that their image of water had improved immediately after the program and remained high until one month after the program.

Tomago et al.[49] studied 16 university students taking a two-night, three-day scuba diving course. The students were divided into an eight-person experimental group and an eight-person control group, with care taken to ensure that the groups were equal in terms of sex, swimming skill, and skin diving skill. The researchers administered a questionnaire, the results of which suggest that incorporating environmental conservation skills suited to the marine environment into the training affects the attitude toward the environment of participants, even those at beginner level.

Funo et al.[50] surveyed the environmental awareness and pro-environmental behavior of competitive sailors, and report that while awareness showed high values, pro-environmental behavior showed low values.

While there are many other practical reports of environmental education that make use of the waterfront, there are currently few studies that attempt to verify their educational effectiveness.

III Discussion

This paper has reviewed theses, case reports, abstracts of presentations at scientific conferences, and reports that describe the educational effects of various activities carried out in marine and waterfront settings. It may be appreciated that one feature of the literature is that there are numerous practical reports.

When attempting to investigate the educational effects of an activity, one method is to objectively evaluate the practical ability of the participants. For example, the researcher can examine whether participants' skill evaluation test scores increase with respect to scores prior to the activity, or whether participants satisfy the evaluation standards of a practical skill test and acquire a qualification. Several studies have been conducted in which results were evaluated using this methodology.

Many of the studies that have been addressed in the present paper test the hypothesis that abilities will increase as a result of the activities performed. In each case, the experience of the program is regarded as an (experimental) intervention, and pre- and post-intervention are compared using linear measures, mainly in the form of questionnaires of different types. However, as has previously been noted, most of the studies referred to in the present paper have no experimental control, which can be identified as a weakness in the experimental design. Therefore, these investigations need to be repeated with study designs that set control
groups and employ randomization. Furthermore, there is a need to re-examine content, such as “increase in zest for living” and other evaluation variables, in order to answer questions such as whether they are differences or proportions. The size and period of trials also need to be given greater consideration.

Table-1 Previous Studies about Educational Benefits of Waterside Nature Experiences and Ocean Education

<table>
<thead>
<tr>
<th>Author</th>
<th>publication year</th>
<th>Subject</th>
<th>Independent variable</th>
<th>Dependent variable</th>
<th>Method</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yamashita et al.</td>
<td>1989</td>
<td>University Student (43 persons)</td>
<td>Voyage training(3 month)</td>
<td>Self-concept</td>
<td>Self-Differential Scale Form A (4 times)</td>
<td>None</td>
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<tr>
<td>Isayama et al.</td>
<td>1998</td>
<td>48 participants (5th to 10th grade)</td>
<td>10 Days Boarding experience (Visiting and Recreational Camp)</td>
<td>Self-concept</td>
<td>Self-Development Scale pre/post/post 60Days</td>
<td>None</td>
</tr>
<tr>
<td>Watakabe et al.</td>
<td>2000</td>
<td>247 participants (Junior high school student)</td>
<td>10 Days Boarding experience (Visiting and Recreational Camp)</td>
<td>General Self Efficacy</td>
<td>General Self Efficacy Scale pre/post</td>
<td>None</td>
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<tr>
<td>Watakabe et al.</td>
<td>2001</td>
<td>100 participants (5th to 10th grade)</td>
<td>10 Days Boarding experience (Visiting and Recreational Camp)</td>
<td>Mental Health</td>
<td>MHP-1 Questionnaire pre/post</td>
<td>None</td>
</tr>
<tr>
<td>Watakabe et al.</td>
<td>2002</td>
<td>Schoolchild (20 persons)</td>
<td>Marine Sports Camp(3 Days)</td>
<td>Mental Health / Social skill</td>
<td>MHP-1 Questionnaire/ Social Skill Scale pre/post</td>
<td>None</td>
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<tr>
<td>Ikotia et al.</td>
<td>2003</td>
<td>University Student (126 persons)</td>
<td>Long-distance swim(4 Days)</td>
<td>Anxiety/Self-respect</td>
<td>STAI / Self-respect Questionnaire</td>
<td>None</td>
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<tr>
<td>Kubo et al.</td>
<td>2003</td>
<td>Upper Grade Elementary School Students (147 persons)</td>
<td>School Water Wise(4 Days)</td>
<td>Self Efficacy</td>
<td>General Self Efficacy Scale pre/post</td>
<td>None</td>
</tr>
<tr>
<td>Okamura et al.</td>
<td>2005</td>
<td>34 participants</td>
<td>5 Day Environmental and Adventure Camp</td>
<td>Attitude / Image</td>
<td>Questionnaire pre · post · post 60days</td>
<td>None</td>
</tr>
<tr>
<td>Aoki et al.</td>
<td>2005</td>
<td>Schoolchild (267 persons)</td>
<td>School Water Wise(4 Days)</td>
<td>Zest for Living</td>
<td>IKR Questionnaire (70 items) pre · post</td>
<td>None</td>
</tr>
<tr>
<td>Shindo et al.</td>
<td>2007</td>
<td>University Student (12 persons)</td>
<td>Intensive Course(Yacht) (5 Days)</td>
<td>Self Efficacy for Yacht</td>
<td>Questionnaire (SMSGSE /Self Efficacy for Yacht)</td>
<td>None</td>
</tr>
<tr>
<td>Yamashita</td>
<td>2006</td>
<td>University Student (28 persons)</td>
<td>Open Water Scuba Training (3 Days)</td>
<td>Zest for Living</td>
<td>IKR Questionnaire (17 items) pre · post</td>
<td>None</td>
</tr>
<tr>
<td>Yano</td>
<td>2007</td>
<td>Upper Grade Elementary School Students (117 persons)</td>
<td>Long-distance swim (6 Days)</td>
<td>Zest for Living</td>
<td>IKR Questionnaire (70 items) pre · post · post 90days</td>
<td>None</td>
</tr>
<tr>
<td>Tomago et al.</td>
<td>2011</td>
<td>University Student (16 persons)</td>
<td>Open Water Scuba Training (3 Days)</td>
<td>Environmental Attitude</td>
<td>Questionnaire of Environmental Attitude pre · post · post60days</td>
<td>None</td>
</tr>
<tr>
<td>Kusieda et al.</td>
<td>2012</td>
<td>University Student (52 persons)</td>
<td>Voyage training (Japan-Honolulu)</td>
<td>Emotional Intelligence Quotient</td>
<td>Competency Highlighter E1 Easy Quickly(CHEQ)</td>
<td>None</td>
</tr>
<tr>
<td>Tomago et al.</td>
<td>2012</td>
<td>University Student (207 persons)</td>
<td>4 day Intensive Course (SCUBA, Long-distance swim, Windsurfing)</td>
<td>Ocean Literacy</td>
<td>Ocean Literacy Questionnaire (36 items) pre · post</td>
<td>None</td>
</tr>
</tbody>
</table>

There are a great many ocean and/or maritime affairs organizations, universities, research institutions, NPOs, civil groups, and other bodies currently carrying out education through activities that make use of the natural environment of the ocean or waterfront. These include cases of short-term, intensive projects and cases in which the
education takes the form of clubs that operate all year round. A feature of the research into the educational effects of such programs to date is that many of the studies focus on children or students taking part in short-term, intensive projects. In contrast, one example of a case where the changes in participants taking part in ongoing educational activities have been monitored is a study by Hakomori. However, studies are exceedingly scarce and even where data is accumulated in a continuous fashion, the number of subjects is very small. This makes statistical processing problematic, so it is difficult at present to compile results into a thesis. Additional longitudinal studies that examine people who engage in ocean activities on a continuous basis will be needed in the future.

There is also a need for research to determine the characteristics of those who have grown to adulthood after experiencing waterfront activities or marine education, and qualitative research chiefly comprising interviews of well-known practitioners or trainers, as well as research examining the meaning of the direct experience that has been emphasized by pioneers in the field. It will be necessary to explore a range of research methodologies in order to carry out such research.

While education about the ocean has historically been focused on training for people who will engage in ocean-related professions, the current demand is for education that targets a wide age range, from elementary school students to working adults.

As a result, it will be necessary to create a systematic research structure in which those persons involved in professional training for merchant shipping, fisheries, defense, and communications, as well as those involved in waterfront nature appreciation activities and environmental education, join together and cooperate in order to resolve the various challenges in the field of marine education.

References
3) Yoshimi Suenga : Basic Act on Ocean Policy of Japan and Marine Education in Japan, International Meeting on Marine Education(Taiwan), pp.11-25, 2009. (In Japanese)
19) Tadashi Yano : The Effect of Summer Seaside Camp(6 days) and IKIRU CHIKARA(Zest for Living) on Upper Grade Elementary School Students, Japan outdoor education journal, 11(1) : 51-64, 2007.
22) Japan Yachting Association coaching upbringing
Educational Benefits of Ocean Education  •  Chiashi et al.

committee: Seamanship and Discipline for Sailors, pp8, 1990. (In Japanese)
42) Camp Sea Lab.: What we have learned: Summery evaluation results from Camp SEA Lab programs 2002-2006:1-5, 2008.
48) Hisayo Tomago, Koichi Chiashi, Yuji Sano : The effect of the scuba training involving the environmental conservation skills to the attitude toward environment of the participants, 11th International Conference on Sports and

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総説
水辺の自然体験活動および海洋教育の教育的効果

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本研究の目的は、水辺の自然体験活動や海洋教育の教育的効果に関して、これまでに実施された文献をレビューし、今後の研究のための基礎資料を得ることである。水辺の自然体験活動および海洋教育に参加することによる、生きる力、自己概念、自己効力感、EQ、メンタルヘルス、健康・体力、海洋リテラシー、環境に対する意識等の変容についての研究成果を認めることができる。しかし、それらの研究デザインの弱さを指摘することが出来ることから、今後は対照群を設けることやランダム化、内容面および評価変数、試験のサイズや期間について再検討する必要がある。さらには、継続的に海の活動に取り組む者を対象とした統計的な研究、著名な実践者及び指導者を対象とした質的な研究や、先駆者のたちの重要視した直接的な体験の意味を問う研究を実施していく必要性があり、そのための研究手法を模索していく必要がある。

キーワード： 教育的効果、水辺の自然体験活動、海洋教育。

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