

Original article

# Activity of the research center for marine education (RCME), the University of Tokyo

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## Introduction

The Research Center for Marine Education (RCME) [1], a part of the Ocean Alliance, was founded at the University of Tokyo by the Nippon Foundation in April, 2010 [2]. With the cooperation of school, teachers, and local government, the aim of the RCME is to promote marine/ocean education in Japanese elementary and secondary schools by developing their curriculum. At school and home, Japanese children acquire knowledge about the ocean on topics such as fishery and geography, and understand that they live in a country surrounded by the ocean. Despite the importance of the ocean to human society, the present Japanese school curriculum on the ocean and class time dedicated to ocean visits are insufficient in schools and in social education facilities.

According to the RCME, three ocean education essentials: environment, life, and security. Based on these, RCME progresses three major missions. The first is the networking teachers for ocean education. The second is the development and practice of the curriculum of ocean education. The third is the evaluation of ocean literacy among school children all over Japan. In 2016, the Ocean Education Pioneer School Program started to support schools that develop ocean education curriculum by offering competitive fund [3] that is organized by RCME, Ocean Policy Research Institute, and the Nippon Foundation. In this study, we report on a survey conducted to evaluate ocean literacy among school children and curriculum development of ocean education.

## Materials and methods

The survey consisted of an ocean knowledge test and a questionnaire of basic information for schools, teachers, and children [4]. The target groups were 6<sup>th</sup> year elementary school students, 3<sup>rd</sup> year junior high school students, and the heads of the target schools. The survey took place between August and November, 2014. Schools and students were selected using stratified sampling, involving three-stage random sampling. During the first stage, the area was selected, during the second the school, and during the third the class. A total

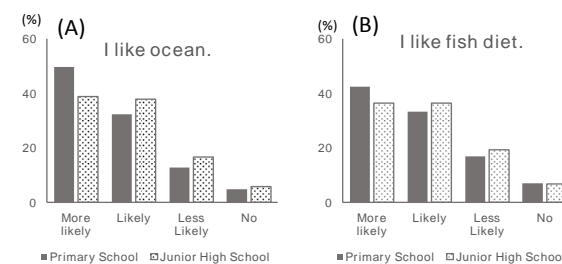
of 55 selected areas, 82 elementary schools and 78 junior high schools kindly agreed to participate in the survey. Overall, 4,574 students completed the survey.

In the Ocean Education Pioneer School Program, 64 and 135 schools in 2016 and 2017, respectively, obtained the grant. Their curriculum concerning fisheries was selected from all programs, and classified and evaluated by their final reports and applications.

## Results

### Questionnaires on learning and life

The results of the “Questionnaires on learning and life” revealed that the combined percentages of children who answer that they like the ocean very much or slightly were 70% and higher (Fig. 1A). The responses to “I like eating fish” were similar, i.e., 70% (Fig. 1B).



**Fig. 1.** The ratio of school children who answered the two questions selected a response from four possibilities. (A) I like the ocean. (B) I like fish.

### Ocean exam

The questions of the ocean knowledge test were categorized as follows: 1) Disaster prevention and safety issues of the ocean; 2) Territory and territorial waters of Japan; 3) Ocean resources and ocean industries; 4) Ocean environment and the ocean ecosystem; and 5) History and culture of the ocean. Here, we selected some questions concerning fisheries and marine biology from categories 3) and 4). The average percentage of correct answers of all questions was 57% in primary schools and 55% in junior high schools.

The important and popular question in fisheries is “What is the name of this fish?” (Fig. 2A). The

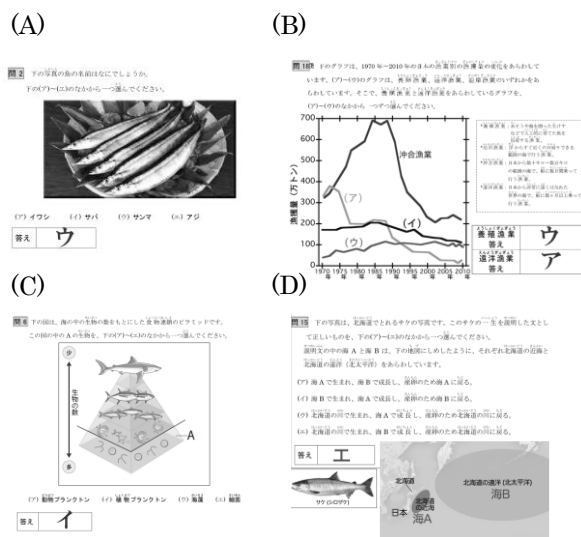
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proportion of correct answers was 76.7% in elementary schools and 81.7 % in junior high schools. The answer is Pacific saury.

The next example of a question for junior high school students is “Which marine organisms is the bottom of the food chain in the ocean?” (Fig. 2B). The average of correct answers was 57.3%. Students understand plankton as a small ocean organisms and as food for other fish and whales. However, they found it difficult to distinguish between zooplankton and phytoplankton.

Another question in fisheries is “Which line in the graph depicting fish caught shows the recent annual change of Japanese ocean fisheries?” (Fig. 2C). The percentage of correct answers was low, 39.2% in primary schools and 49.6% in junior high schools. Students’ knowledge of fisheries and the ocean industry is limited, despite learning about it at school.



**Fig. 2.** Question and answer from an ocean exam. (A) What is the name of the fish shown in the picture? The fish is a Pacific Saury. (B) Which marine organism is at the bottom of the food chain in the ocean? The answer is phytoplankton (not zooplankton, seaweed, or bacteria). (C) Which line in the graph depicting fish caught shows the recent annual change of Japanese ocean fisheries? The number of fish caught by ocean fisheries largely decreased, and that by aquaculture fisheries slightly increased and then did not change. (D) The salmon is born in a river in Hokkaido, grows in the Bering Sea, and then comes back to its river of birth in Hokkaido to breed.

The other question for junior high school students is “Which are the areas of birth, growth, and migration of chum salmon in Japan?” (Fig. 2D). The percentage of correct answers was 33%. The low value indicates a lack of well-ordered knowledge, which may be due to a less interdisciplinary curriculum in school. To answer this question, knowledge of biology, ecology, fishery, and geography is required. The advantage of ocean education lies receiving interdisciplinary education through systematic learning.

#### Ocean Education Pioneer School Program

Examples of curriculum themes related to fisheries are aquaculture, seafood business, fishing, landfall, coastal

cleaning, salmon, scalps, plankton, Japanese eel, sea algae, climate change, and ocean acidification. Most of all lean on the local fishery and characteristics of local coast, by developing the unique curriculum.

#### Discussion

The correct answer ratio varies by the questionnaire’s content and student ability. However, we received valuable evidence of the advantages of ocean education in school as a convincing method. The results showed that respondents scored lowest in the “complex knowledge and thinking” category. As such strengthening ocean education will fit to increase interdisciplinary ability.

When children become familiar with the ocean, and how to protect it, human activity becomes sustainable and conscious of the earth. However, the problem is that children have little chance to go to the sea because parents and school teachers do not want to go to the “dangerous” ocean. And also, taking a bus to go to the ocean is expensive. As a result, both children and adults have poor literacy regarding the ocean. Another reason for poor ocean literacy is the shortcoming in the Japanese education system. The dis-connected curriculum deprives children of learning and understanding ocean phenomena.

Some schools on the seaside with an ocean education the curriculum using the Period of Integrated Studies. The exchange of these activities is needed between schools which progress ocean education. RCME works continuously to enlighten the importance of ocean education through curriculum development.

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