

# Evaluation of Marine Education's Effect in Elementary and Junior High Schools—Analysis of the Value Consciousness Using Text Mining

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**Abstract** In Japan “Basis Act on Ocean Policy” was enacted in 2007 and then “Basic Plan on Ocean Policy” was enacted in 2013, which is advocated “to be enriched education about ocean in elementary, junior and senior high school.” However the learning contents of marine education, teaching methods and measurement of effectiveness are still remains an open research problem due to less practice cases. The purpose of this study was to evaluate the effect of marine education in elementary and junior high schools through an analysis of the value consciousness using text mining. This study was employed a questionnaire survey targeting all elementary school's 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup> and junior high school's 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> grades in Noto town, Ishikawa prefecture, Japan. Only one elementary school had received marine education, which is called satoumi learning, as a pilot school. A comparison was made between the students of the pilot school and the students of the other four elementary schools and the students of four junior high schools. The students of the pilot school have the highest motivation to engage in satoumi learning compared to other elementary and junior high school students. According to the structure of consciousness, the students of the pilot school used term of “precious” to present about ocean. The results appear to show that marine education affected their value consciousness. On the other hand, other elementary school students imagined a connection with ocean through daily life. The junior high school students recognized that satoumi learning is connected to their community, life, and future. Therefore, the study determined that implementing relatable learning content in a child's daily life is required to foster their relationship with nature.

**Keywords:** *marine education, satoumi learning, educational effect, value consciousness, text mining*

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## 1. Introduction

Environmental Education aims to understand the connectivity between all ecological relationships, including the relationship between humanity and nature, and between people. Furthermore, it is endeavored to encourage students to participate in sustainable community development. As such, “community development nucleated schools,” which is required the cooperation of parents and community is required to achieve this aim. UNESCO, in co-operation with UNEP in Tbilisi, was established the “Tbilisi Declaration” in 1977, which was the starting point for international activity related to environmental education. The five categories of environmental education objectives are Awareness, Knowledge, Attitudes, Skills, and Participation. For the purposes of this article, the authors focus on “Attitudes,” which is “to help social

groups and individuals acquire a set of values and concerns for the environment, and the motivation for actively participating in environmental improvement and protection.” [1,2]

Environmental Education is conducted in classes of social studies or science, and period of integrated studies cross-curriculum learning in Japan. [1] On the other side “Basis Act on Ocean Policy” was enacted in 2007 and then “Basic Plan on Ocean Policy” was enacted in 2013, which is advocated “to be enriched education about ocean in elementary, junior and senior high school.” However the learning contents of marine education, teaching methods and measurement of effectiveness are still remains an open research problem due to less practice cases. [3]

Takeno et al. (2015) indicated the importance of considering a learner's consciousness and make suitable learning contents. This study was clarified value consciousness of junior high school students about agriculture learning, and suggested that a suitable teaching plan considering the learner's

value consciousness be made. [4] “Value consciousness,” which is referred to under “Attitude” of the Tbilisi Declaration, is effective when creating suitable learning content.

The literature concerning consciousness for marine education is, however, limited. For example, Chiashi et al. (2012) clarified that ocean literacy can be considered to comprise two aspects, “ability to explain” and “ability to understand,” by taking phrases collected from leaders in seashore experience activities and fisheries vocational high school teachers. [5] From there, they developed and verified the internal consistency of the “ocean literacy questionnaire” for elementary students based on the results. However, this questionnaire was developed by taking phrases only from adults, as described above. [6] Child students’ consciousness for marine education still remains an open research problem for creating a suitable teaching plan. The research aims to be evaluated marine education in elementary and junior high schools through an analysis of the value consciousness for marine education, and consider suitable teaching approaches that consider value consciousness.

## 2. Material and Methods

### 2.1. Subject for Investigation

The study was conducted a questionnaire survey among elementary and junior high school students who have participated in satoumi learning in Noto town, Ishikawa prefecture, Japan. Noto town has conducted marine education since 2015 as a part of a “community development nucleated school.” One elementary school was designated as a pilot school for marine education since April 2015, which is called satoumi course. Satoumi refers to a coastal area where biological productivity and biodiversity has increased through human interaction. [7] All other four elementary schools and four junior high schools in Noto town was implemented marine education one year later. The satoumi course is a “practical education to take pride of one’s hometown and develop local love through marine experimental learning towards implementing rich locality and active school education.” [8] The course is comprised four kinds of activities in close relation with the ocean, such as beach observations (Figure 1), community festival studies, beach cleanups, and cooking squid etc.



Figure 1. A class in the Satoumi course

### 2.2. Research Method

This study was employed a questionnaire survey targeting all the elementary school’s 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, and junior high school’s 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> grades in Noto town. The questionnaire was distributed among 557 students through the Noto-cho board of education in January 2016. 545 questionnaires were returned, with a response rate of 97.8%. Only one elementary school had received marine education when the questionnaire was distributed. The questionnaire asked participants to indicate their school’s name, grade, sex, motivation to participate in satoumi learning according to a 5-point scale (strongly agree, agree, neutral, disagree, strongly disagree), and value consciousness for satoumi learning in a free descriptive answer. The free descriptive question was: “How is satoumi learning useful for your life and future?”

After collecting the questionnaires, we conducted text mining to identify students’ value consciousness for satoumi learning by using co-occurrence network analysis in KH Coder Ver. 2.00e, which was developed by Higuchi. [9] Co-occurrence network analysis can make visible students’ structure of consciousness using extracted terms. The answers to the free descriptive question are read into the KH Coder. KH Coder can divide data into units called morphemes, the smallest possible units of text, and can thereby extract more apparent term patterns. The extracted terms are drawn in a circle; circles appearing pattern similar can draw a network of collocation connected by a line. [10] In this paper, we focus on solid lines that show the strong relationship of co-occurrence.

## 3. Results

Figure 2 shows the result of motivation to participate in satoumi learning. “A” is the pilot school, “B”, “C”, “D”, “E” are other elementary schools, “F”, “G”, “H”, “I” are junior high schools in the Figure 2. “A” elementary school students who received marine education have the highest motivation to participate in satoumi learning compared to other elementary and junior high school students. Nearly 88.6% of students affirmatively answered “strongly agree” and “agree” to participate in satoumi learning. On the other hand, no student answered negatively “disagree” and “strongly agree”.

Using KH Coder, the value consciousness for satoumi learning was examined to extract common term patterns. We divided the students into three groups: 1) students from the elementary school with the satoumi course as part of the curriculum; 2) students from the other four elementary schools; and 3) students from the four junior high schools. The frequency of the extracted terms is summarized in Table 1. Table 2, Table 3, and Table 4 show the frequency pattern of the terms from the extraction results of the pilot school, other elementary schools, and junior high schools. Shaded sections are indicated the terms that do not overlap with other groups. “Japanese amberjack,” “drown,” “make,” “select,” “proud,” “garbage,” “plastic bottle,” and “coastal area” are extracted as characteristic terms and were used by the students of the pilot school.

From this result, we can observe that they are aware “ocean” is “precious” from satoumi learning. Moreover,

they can be proud of “environment” through the learning, for example, the environment in which they live near the ocean. Characteristic terms such as “fisherman,” “species of fish,” “food,” “fish name,” “swim,” “catch,” “adult,” and “distinguish” were extracted from the students of other elementary schools. Furthermore, characteristic terms such as “play,” “knowledge,” “relationship,” “life,” “community,” “disaster,” and “child” were extracted from the junior high school students. The junior high school students are aware of the connection between satoumi learning and “life” in “community,” “disaster” etc.

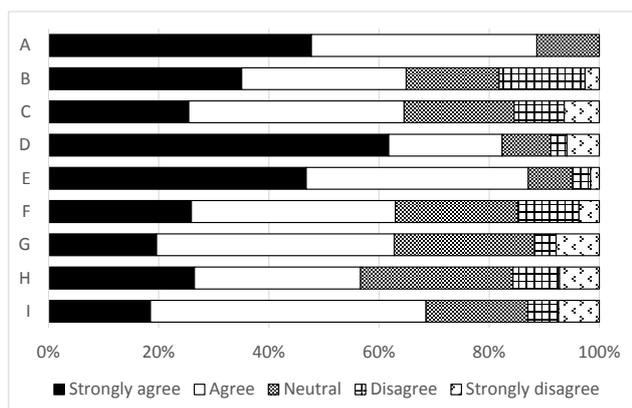


Figure 2. Motivation to participate in satoumi learning

Table 1. Frequency patterns of term usage from the results of extraction

Extracted term		Frequency of term usage
In English	In Japanese	
Fish	魚	189
Ocean	海	173
Eat	食べる	62
Cooking	料理	30
Danger	危険	24
Tasty	おいしい	23
Teach	教える	23
Work	仕事	23
Fisherman	漁師	22
Fish	釣り	21
Beautiful	きれい	19
Environment	環境	15
Food	食べ物	12
Play	遊ぶ	12
Species of fish	魚の種類	11
Fish name	魚の名前	11
Life	生活	11
Precious	大切	11
Buy	買う	11
Japanese amberjack	ブリ	10
Children	子供	9
Adult	大人	9
Knowledge	知識	9
Drown	溺れる	9

Table 2. Frequency pattern of terms from pilot school extraction results

Extracted term		Frequency of term usage
In English	In Japanese	
Ocean	海	18
Japanese amberjack	ブリ	11
Fish	魚	11
Cooking	料理	9
Beautiful	きれい	6
Drown	溺れる	4
Make	作れる	3
Select	選ぶ	3
Buy	買う	3
Precious	大切	2
Proud	自慢	2
Environment	環境	2
Work	仕事	2
Eat	食べる	2
Garbage	ゴミ	2
Plastic bottle	ペットボトル	2
Coastal area	海岸	2

Table 3. Frequency pattern of terms from other elementary school extraction results

Extracted term		Frequency of term usage
In English	In Japanese	
Fish	魚	139
Ocean	海	97
Eat	食べる	43
Fisherman	漁師	20
Danger	危険	18
Tasty	おいしい	17
Teach	教える	17
Fishing	釣り	16
Work	仕事	12
Cooking	料理	12
Species of fish	魚の種類	10
Food	食べ物	10
Beautiful	きれい	9
Fish name	魚の名前	8
Buy	買う	8
Swim	泳ぐ	7
Catch	獲る	7
Adult	大人	7
Distinguish	見分ける	6

Table 5 shows the frequency of the extracted terms and character per person. Other elementary school students used more number of the extracted terms than the pilot school and junior high school students. Junior high school students used less number of the characters than other elementary school students. Moreover, the pilot school





“community.” They considered that keeping the ocean beautiful would lead to the vitalization of local communities, and it is important to learn about marine from viewpoint of living environment. Eating and fishing are common terms between elementary and junior high schools.

#### 4. Discussion

The students of the pilot school have the highest motivation to participate in satoumi learning. According to the structure of consciousness, they think the ocean is “precious”. The results are appeared to show that marine education affects their value consciousness. On the other hand, other elementary school students did not use the term “precious.” They imaged their connection with ocean through daily life. Making learning content relatable to daily life is required to learn relationship with nature. The junior high school students recognized that satoumi learning is connected to their community, life and future. These findings show that satoumi learning can heighten motivation and teach the importance of ocean.

Nevertheless, we can deduce that it is still hard to understand the connectivity with all things, even within our own community, for elementary school students. Therefore, learning content should be relate to daily life so that students can understand better connect with nature.

#### 5. Conclusion

The pilot school still has been continued satoumi learning next year and all other four elementary and four junior high schools in Noto town also have started marine education one year later. Further studies are needed in order to clarify concrete content of marine education in each schools, the changes in students’ consciousness by comparing before and after marine education to make effective practice.

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