

Korean elementary school students' perceptions of relationship with marine organisms

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Abstract

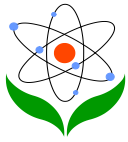
This exploratory study examined the perceptions of, and relationship with, marine organisms of 81 urban sixth grade Korean students using a specifically designed survey questionnaire. The study outcomes revealed that these Korean students have limited experience with and different levels of connectedness to marine organisms. Viewed through Kellert's framework of biophilic typology, these Korean students' perceptions of valuing marine organisms were highly utilitarian, negativistic, and scientific in character. This research provides marine environmental educators and practitioners with insights into the varied perceptions of Korean elementary school students. The study's findings may provide insights on the development of ideas on how to more effectively design marine environmental educational experiences that increase ocean literacy within this demographic and possibly other students with similar cultural backgrounds.

Academic discipline: science education; environmental education; marine education

Keywords: connectedness; marine education; ocean literacy; students' perceptions

Introduction

The world's oceans provide numerous habitats for sea organisms and also have a tremendous impact on human life within the domains of food, oxygen, climate control, fresh water sources, transportation, and the development of history and culture (Mayer & Fortner, 1985). Hence, the public's ocean literacy, that is the understanding of the mutual influences shared by the ocean and humankind, is integral to the Earth's sustainability¹ and the well-being of humankind (Cava, Schoedinger, Strang, & Tuddenham, 2005). Based on our review of the relevant literature (Ocean Project, 2009; Steel, Smith, Opsommer, Curiel, & Wagner-Steel, 2005), few empirical studies have investigated the public's ocean literacy worldwide. Moreover, to the best of our knowledge at the time of this publication, there are no known published studies of East Asian participants' ocean literacy. Of the few surveys administered in this field, research conducted by the Ocean Project (1999, 2009) revealed that the general public in the United States is not knowledgeable about ocean issues related to the health of the marine environment. Plankis and Marrero (2010) reported that this low level of ocean literacy is not

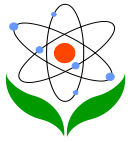


limited to adults but is also evident among students in grades K-12. Therefore, these low levels of knowledge which may be pervasive in today's societies suggest an imperative to increase ocean literacy and to foster environmental caring, connection, and advocacy globally (Scott, 2007).

To create a more ocean literate society, the Ocean Literacy Campaign was initiated by a group of marine educators and scientists in 2002 in the United States, and the ocean literacy campaign group developed the Essential Principles of Ocean Literacy [EPOL] (Cava et al., 2005). Considering the fact that the EPOL illustrates the inextricable connectedness between the ocean and humans, students' awareness of their connectedness to marine plants and animals is critical to the development of their ocean literacy. Although a number of research studies have explored students' perceptions of plants and animals (cf. Barman, Stein, McNair, & Barman, 2006; Cummins & Snively, 2000; Eagles & Muffitt, 1990; Kellert & Westervelt, 1983; Shepardson, 2002), of these aforementioned studies, few examined students' perceptions of their relationship with marine organisms. Furthermore, and previously alluded to, relatively little attention has been paid to modern day Asian contexts in terms of ocean literacy, particularly in Korea. This lack of attention is an interesting paradox since Korean Society has had a long history of cultural affinity with the ocean. Yet today the country's coastal areas have been severely exploited and degraded (Je, Lee, & Jung, 2001). Also the younger student demographic (from 6 to 12 years of age) has not often been considered for investigation within Asian cultural contexts. Thus, given these arguments, and the lack of empirical research studies on this topic, it would seem that there is a warrant to investigate Korean students' understandings of their relationship with marine organisms and how their awareness of the ways they are connected to the ocean realm informs their ocean literacy.

This exploratory study was instigated to answer the following three questions:

1. What are urban Korean elementary students' experiences with marine organisms?
2. What is the nature of urban Korean elementary students' awareness of their connectedness to marine organisms in the Korean cultural context?
3. What is the nature of urban Korean elementary students' valuing of marine organisms?



This research and the answers to the questions provide marine environmental educators and practitioners with insights into how students perceive their connectedness to and values of marine plants and animals. This study's findings also highlight what educators might consider when they facilitate marine environmental learning experiences with the goal to increase ocean literacy among this demographic and possibly other students with similar cultural backgrounds.

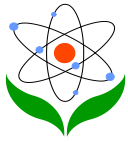
¹*Sustainability in this paper refers to Environmental Sustainability which can be defined as the maintenance of natural resources such as soil, atmosphere, forest and water (Goodland, 1995). Understanding humans' influences on these limited resources is essential to set the goals of levels of sustainability and to bring human's responsible actions.*

Theoretical Framework and Literature Reviews

Since this study examined elementary students' perceptions of their relationship with marine organisms in Korean social and cultural contexts, we employed sociocultural theory as a lens to interpret their perceptions. Sociocultural theory explains that individual's learning and cognition are influenced by their social and cultural contexts (Vygotsky, 1978; Wertsch, 1991a, 1991b). Given that literature reviews guide the directions of analysis and interpretation and eventually help with answering the research questions, which dictate the study's process, we also reviewed literature related to human-nature connectedness and values of nature for an analytical framework.

Sociocultural Theory

Learning can be defined as the process of acquiring knowledge, skills, attitudes, values, and beliefs through transformation of experience (Kolb, 1984). From a sociocultural perspective, learning and cognition are typically situated in social and cultural contexts and are rarely decontextualized (Vygotsky, 1978; Wertsch, 1991a, 1991b). The dynamic interdependence of social and individual processes as underscored by Vygotsky (1978) conceptualizes development as the transformation of socially shared activities into internalized processes (John-Steiner & Mahn, 1996). The basic principle of a sociocultural approach to mind is that "human mental functioning is inherently situated in social, interactional, cultural,

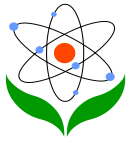


institutional, and historical context” (Wertsch, 1991b, p. 86), and mediated by language and other symbol systems (John-Steiner & Mahn, 1996). Thus, the product of learning can be viewed as something socioculturally constructed, and students’ knowledge, perceptions, values, and attitudes about the ocean and marine organisms can be quite different depending on their sociocultural backgrounds.

Connectedness to Nature

In the field of environmental psychology, the term ‘connectedness to nature [CN]’ refers to the degree to which individuals associated themselves with nature (Mayer & Frantz, 2004; Schultz, 2002). CN represents individuals’ sense of ‘oneness’ with the natural world which is similar to the deep ecology concept of ecological self or environmental identity (Clayton, 2003). A number of researchers have reported that individuals’ (a) beliefs about nature, (b) strong emotional affinity, and (c) positive experiences with nature are important mediators to increase their CN (Dunlap, Van Liere, Mertig, & Jones, 2000; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2009). Also an individual’s CN plays a key role in the development and facilitation of responsible environmental attitudes and behaviors (Feral, 1998; Goralnik & Nelson, 2011; Mayer & Frantz, 2004; Schultz, 2002). In turn, a person who has a higher level of CN will be associated with more caring for nature and a higher rate of commitment to protect nature (Schultz, 2002). In addition to the three components outlined above, sociocultural variables such as age, gender, ethnicity, area of residence, and parents/family are also proposed as additional indirect factors to strengthen or weaken an individual’s CN. For example, family members who share their values and enjoyment of nature may significantly contribute to children’s development of an emotional affinity to nature (Kals, Schumacher, & Montada, 1999) and also motivate pro-environmental actions (Chawla & Cushing, 2007; Cheng & Monore, 2010).

To measure individuals’ CN, several scales have been developed including the New Environmental Paradigm Scale by Dunlap et al. (2000), Inclusion of Nature in Self by Schultz (2000), Implicit Associations Test by Schultz, Shriver, Tabanico, and Khazian (2004), Connectedness to Nature Scale by Mayer and Frantz (2004), and Connection to Nature Index by Cheng and Monroe (2010). While the above mentioned instruments employed a closed-ended questionnaire, Vining, Merrick and Price (2008) examined individuals’ CN using open-ended questions. A review of the literature on CN measurement indicates that although many instruments were designed to assess individuals’ overall CN, the majority did not focus specifically



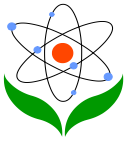
on components of nature (e.g., forest, ocean, or wildlife). In addition, most instruments were designed for adults rather than children. Hence, these particular tools may have limited utility in the case of the demographic of Korean children, but the construct of CN is an important dimension to understand given the warrant previously discussed and the research questions of this study.

Values of Nature

The term 'value' has various meanings in different contexts. Dietz, Fitzgerald, and Shwom (2005) suggest it has three interpretations: "what something is worth, opinions about that worth, and moral principles" (p. 339). An individual's feelings of CN are related to values (Dietz et al., 2005) because objects (e.g., plants, animals, and other people) are more valued when individuals feel such objects represent themselves (Schultz, 2002). In this sense, the values of nature can be actualized by human-nature relationships (Rolstone, 1981). Nature can be perceived differently by the values placed on it (Lamb, 1996). Such a perception will influence humans' attitudes toward nature, which will impact their actions on behalf of the natural world (Muir, 1901 cited in Goralnik & Nelson, 2011).

There are a number of researchers who have conceptualized the values associated with nature. For example, Rolston (1981) conceptualized the following ten values: economic value; life support value; recreational value; scientific value; aesthetic value; life value; diversity and unity values; stability and spontaneity values; dialectical value; and sacramental values. Robertson (1998) synthesized the value of nature into three categories that include intrinsic, inherent, and instrumental values. Instrumental value, in particular, is assessed by an awareness of the human relationship with nature. Based on their empirical studies on humans' biophilic typology toward wildlife, Kellert and Westervelt (1983) placed the value of nature in the following nine categories: naturalistic, ecologicistic, humanistic, moralistic, scientific, aesthetic, utilitarian, dominionistic, and negativistic.

Since values of nature are often constructed early in life through interaction with physical and social environments (Kahn, 2002) and are tied to one's identity (Schwartz, 2006), these values become a relatively stable element of one's personality (Steg & De Groot, 2012). The value - attitude - behavior hierarchy (Homer & Kahle, 1988) was examined in the environmental domain and confirmed that values are crucial and functional in attitude formation as well as behavior development (Milfont, Duckitt, & Wagner, 2010; Vaske & Donnelly, 1999). Also, values can be "better predictors of pro-environmental norms and intentions than



ecological worldviews and environmental concerns” (Steg & De Groot, 2012, p. 89).

From the perspectives of sociocultural theory, learning outcomes such as knowledge, perceptions, values, and attitudes are socioculturally constructed. In this sense, individuals’ perceptions of connectedness to and values of nature can be distinctive reflecting their previous experiences as well as cultural and historical context. Hence, we find that a hybrid framework incorporating Sociocultural Theory, Connectedness to Nature, and Values of Nature will be an effective lens to understand urban sixth grade Korean students’ experiences with, connectedness to, and values of marine organisms which are crucial components of ocean literacy development.

Methods

Design and Instrument

This exploratory study employed a mixed method design, specifically validating quantitative data model (Creswell & Plano Clark, 2007). This design was selected to “validate and expand on the quantitative findings from a survey by including a few open-ended qualitative questions” (p. 75). We developed a survey comprised of 11 pictures of different marine organisms with three associated questions for each (Figure 1).


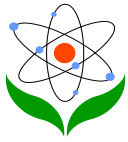
	(a)	(b)	(c)
Marine Organism	My Experiences (Check all applicable)	My Connectedness	The reason is ...
 Crab	① ② ③ ④ [] [] [] [] ①=direct (e.g., sea) ②=indirect (e.g., aquarium, market ③=vicarious (e.g., book, TV, film ④=none	very weak moderate very strong ----- ----- ----- ----- 1 2 3 4 5 [] [] [] [] [] ☀ I don't know []	

Figure 1. A sample question of the questionnaire.



The marine organisms listed in the survey include: dolphin (representing mammalia), sea gull (aves), sea turtle (reptilia), salmon (osteichthyes), crab (crustacea), sea star (asteroidea), sea worm (polychaeta), sea anemone (anthozoa), jellyfish (or jellies, representing hydrozoa), and sea lettuce (chlorophyta). Several species of plankton (chaetoceros, coscinodiscus, skeletonema, and copepod) were included as one group to represent micro marine organism. We selected these specific marine organisms because they are relatively familiar to elementary students and/or common to the Korean marine environment. The one exception was the sea turtle. Many sea turtle species are endangered and not common in the Korean marine environment. However we included this animal in the survey to understand the students' perceptions of a diverse group of marine organisms.

In Figure 1, part (a) of the survey was designed to check the students' different types of experiences with given marine organisms in keeping with Kellert's (2002) experiential categories. Direct experience was explained to the students as encountering marine organisms in their natural habitats (e.g., live crabs under the rocks in the beach) while indirect experiences was explained as encountering marine organisms in non-natural habitats (e.g., crabs in the market). Also vicarious experience was explained as seeing marine organisms mediated by books or Internet (e.g., pictures of crabs in the storybooks). In part (b), the term 'connectedness' was explained as "the degree of association with each organism biologically, ecologically, emotionally or experientially". In an attempt to help the students understand this term, sample descriptions were provided. The students' awareness of their connectedness with the marine organisms was evaluated using a five-point Likert scale with "1" indicating a very weak connectedness and "5" for very strong connectedness. The option of "I don't know" was also provided for students who were unsure about the extent of their connectedness. Part (c) provided the students with a space to describe reasons why they chose a certain degree of connectedness with the given organisms.

The newly developed questionnaire was reviewed by the author team and sent to an elementary school teacher who has a Ph.D. degree in science education and teaches grade 6 science in Seoul, Korea with the intent to check the questionnaire's construct validity. The teacher was requested to (a) consider whether the items for each marine organism would capture the specific aspect of students' perceptions of relationship with marine plants and animals, (b) point out any word that might not be clear to Korean students, and (c) evaluate appropriateness of a sample answer for the open-ended question. The teacher's review led to the modification of some



words prior to field testing. The same teacher was also asked to pilot-test the questionnaire with her students (grade 6, age of 13, n=10). The questionnaire was further refined through discussion with the teacher, and several vocabulary terms were changed.

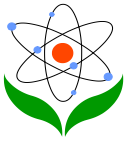
Participants and Procedure

As this was an exploratory study, purposive sampling was adopted. We selected sixth grade Korean elementary school students (13 years old) as this age is a critical period for an individual to develop a relationship with the natural world (Sobel, 1993). It was also our intention to select students with an average level of academic achievement, who came from middle class families, and were residents of Seoul (a highly urbanized city accommodating 10.5 million people, and approximately two hours drive distance to the ocean). Three Korean elementary schools in Seoul were contacted to recruit student volunteers to participate in the research project.

The purpose of the project was explained to both school principals and teachers. The two elementary schools that agreed to participate were sent (1) cover letters, (2) consent forms, and (3) hard copies of questionnaires with stamped return envelopes. All materials including the questionnaire were written in Korean language script. Three classes (grade 6) from each school were invited to join this study. The science teachers in each school were asked to explain the consent form and distribute the questionnaire to their students during regular class time. The students were also asked to submit his/her questionnaire as well as assent/consent forms in a sealed envelope to the science teacher who then collected and mailed them to the researchers. A total of 104 copies of the questionnaire were distributed to the students and 81 copies (42 girls, 52%; 39 boys, 48%) were returned to the researchers for analysis.

Analysis

Based on the self-reporting questionnaires, the 81 students' previous experiences with given marine organisms were analyzed through frequency counts. The students' average connectedness scores with each organism were calculated from their responses recorded on the five-point Likert scales. Responses checked as "I don't know" were eliminated and treated as missing values. Lastly, the reason why students chose a certain degree of connectedness, via their written responses, were coded using a priori codes list (Table 1) generated from Biophilic Typology toward wildlife (Kellert & Westervelt, 1983). The coded qualitative data were transformed



to quantitative data through frequency counts, where each written response in part c) for each of the 11 organisms on the questionnaire was coded for all 81 students. A total of 446 responses were available for coding and subsequent analysis, since not every student gave a reason for why they rated “connectedness” the way they did and ascribed value via their biophilic typology. Two kinds of analyses were performed. First, an overall descriptive assessment of all students’ ascribed values of all marine organisms in terms of their Biophilic Typology. Second, a description of students’ most dominantly held biophilic values for each of the 11 marine organism examined by the questionnaire.

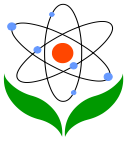
Table 1. A Priori Codes List for Valuing Marine Organisms

Term	Code	Definition
Naturalistic	NAT	Students view the marine organisms based on personal interest, curiosity, and a sense of wonder.
Ecologicistic	ECO	Students view the marine organisms focusing on entire system (i.e., humans as a part of ecosystem)
Humanistic	HUM	Students view the marine organisms based on personal affection for individual organisms with strong anthropomorphic association.
Moralistic	MOR	Students view the marine organisms based on ethical concerns for the wrong treatment.
Scientific	SCI	Students view the marine organisms focusing on interest in physical attributes and biological functions.
Aesthetic	AES	Students view the marine organisms based on interest in the physical attractiveness and symbolic characteristics of marine organisms.
Utilitarian	UTL	Students view the marine organisms based on interest in humans’ practical needs.
Dominionistic	DOM	Students view the marine organisms based on interest in the mastery and control of marine animals.
Negativistic	NEG	Students view the marine organisms based on an active avoidance of animals due to dislike or fear.

Results and Discussion

Previous Experiences

With the reference to Table 2, the students’ experiences are dominantly vicarious as seen by the total number of responses compared to direct and indirect experiences. This suggests that most of their experiences with marine organisms are derived through experiences like TV programs, films, and books rather than direct or indirect encounters. However, the majority of students had direct experiences with



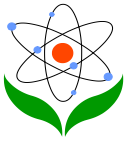
'gull', 'fish', and 'crab' in these organisms' natural habitats. Nearly half of the students encountered 'dolphin' in non-natural settings such as a zoo and/or aquarium. Approximately three in ten students had indirect experiences with 'sea turtle' in these non-natural settings. However, very few students reported they had encounters with 'sea worm', 'sea anemone', 'sea lettuce', and 'plankton' directly or indirectly. More than half of the students did not have vicarious experiences with 'sea worm', 'plankton', and 'sea lettuce'.

Table 2. Students' Experiences with Marine Organisms

Direct		Indirect		Vicarious		None	
Crab	59	Crab	47	Dolphin	62	Sea lettuce	50
Sea gull	58	Fish	41	Sea turtle	61	Plankton	42
Fish	51	Dolphin	39	Sea gull	55	Sea worm	42
Sea star	38	Sea turtle	26	Fish	55	Sea anemone	30
Jellyfish	37	Sea lettuce	17	Jellyfish	55	Sea star	11
Sea worm	24	Sea star	12	Sea star	54	Sea turtle	8
Sea anemone	8	Jellyfish	6	Sea anemone	50	Dolphin	5
Dolphin	7	Plankton	3	Crab	49	Jellyfish	5
Sea lettuce	7	Sea anemone	1	Plankton	38	Sea gull	2
Sea turtle	2	Sea worm	1	Sea worm	25	Crab	0
Plankton	1	Sea gull	1	Sea lettuce	15	Fish	0
Total (n)	292	Total	194	Total	519	Total	195

Note. Frequency was generated from the students' multiple responses on each category

Given that children's experiences of nature are essential and critical for their maturation and development (Kellert, 2002), and those experiences are associated with nature-friendly behaviors in adulthood (Van den Born et al., 2001), the participants' self-reporting could justify that more direct and indirect experiences with various marine organisms should be provided to facilitate a balanced and in-depth understanding of marine plants and animals. Burgess and Mayer-Smith (2011) discuss this view in their study that found students' direct experiences in a wilderness program increased their aesthetic, humanistic, moralistic, symbolic, naturalistic, and ecological-scientific valuing of nature. Also Yore and Boyer's (1997) study reported similar results as they found that students' direct experiences influence their ecologicistic, scientific, humanistic, moralistic, and naturalistic valuing of animals.



Connectedness to Marine Organisms

The students showed a wide range of connectedness scores depending on the marine organism (Figure 2). The students' responses indicated that they have a strong affiliation with 'fish', 'crab' and 'sea lettuce', a moderate affiliation with 'gull', 'dolphin', 'jellyfish', 'plankton', and 'sea star', and a weak affiliation with 'sea turtle', 'sea worm', and 'sea anemone'.

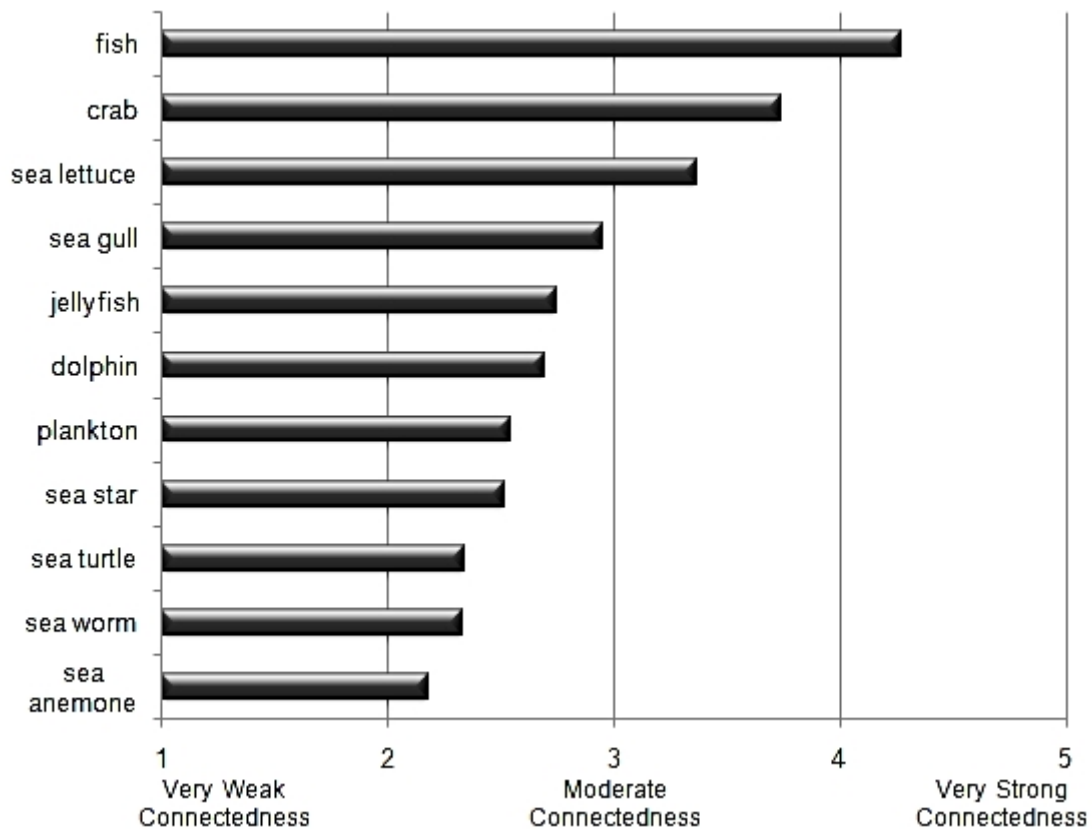
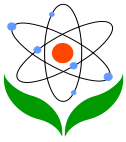


Figure 2. Students' connectedness with each marine organism.

A high score of connectedness with 'fish', 'crab' and 'sea lettuce' might originate from the students' frequent encounters with the organisms and/or their utilitarian value of each. Moderate connectedness scores emerged from the students who had frequent encounters with the organisms but did not indicate a specific relationship with the organisms (e.g., sea star and gull), or those who did not frequently observe the organism but knew how they were related to the organisms either taxonomically or functionally (e.g., dolphin, jellyfish, and sea star). Weak connectedness scores with 'sea turtle', 'sea worm', and 'sea anemone' might be related to the students' lack of direct experience with these organisms as well as



their inability to find commonalities. The following excerpts are representative of the students' strong, moderate, and weak affiliations with the marine organisms.

- Strong: "I am closely connected to fish because I can see and eat it very frequently."
- Moderate: "I saw and fed sea gulls many times, but I don't know how it is directly related to me."
- Weak: "I haven't seen sea anemone directly, and it has nothing to do with our life."

Only three connectedness scores with fish, crab, and sea lettuce revealed higher than the median, which indicates that the participating students are not well aware of their connectedness to other categories of marine organisms. Phytoplankton for example, has an extremely integral relationship with human beings; benefits to humans include providing half the oxygen we breathe, playing a basic producer role in marine food chain, contributing to climate regulation by carbon dioxide absorption. However, forty-two percent of the students checked "I do not know" about their connectedness to plankton and the connectedness score with plankton revealed lower than the median.

Values of Marine Organisms

The results depicted in Figure 3 represent an analysis of the 446 coded reasons for valuing marine organisms from the 81 student participants and illustrate the proportion of the coded reasons by different Biophilic Typology of valuing marine organisms as a percentage. For example, 107 coded reasons out of 466 cases (23 %) were related to the students' utilitarian perspectives (UTL), while only 12 descriptions out of 466 cases (2.6 %) were related to aesthetic perspectives (AES). On the whole, this analysis demonstrates that the students' overall perceptions of valuing marine organisms were highly utilitarian, negativistic, and scientific and lacking in aesthetic, humanistic, and moralistic values.

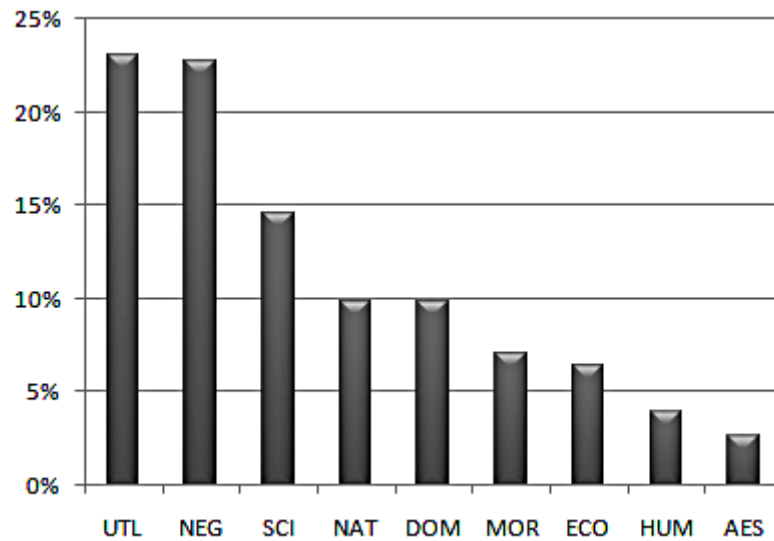
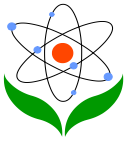


Figure 3. Overall valuing of marine organisms.

A utilitarian value is typical in the students' relationships with fish, crab, and sea lettuce; negativistic value emerges from the students' awareness of a relationship with jellyfish and sea worm; scientific and ecologicistic values are closely linked to the relationship with sea anemone and plankton; naturalistic value is generally related to the relationship with sea turtle; and dominionistic value mainly comes from the relationship with dolphin and sea gull (Figure 4).

Students held various perspectives on values of marine organisms. For example, diverse values of crab were described by the students. In the instance of this marine organism (crab), of the 66 students who gave a reason for their levels of connectedness, 37 of the descriptions (56%) demonstrated utilitarian perspectives, while the remaining descriptions were distributed as follows: scientific (10); negativistic (8); moralistic (5); humanistic (3); naturalistic (1); ecologicistic (1); and dominionistic (1) perspectives. Hence, students dominantly hold utilitarian perspectives of crab. Figure 4 illustrates the overall most dominantly held values of the 81 students for each marine organism.

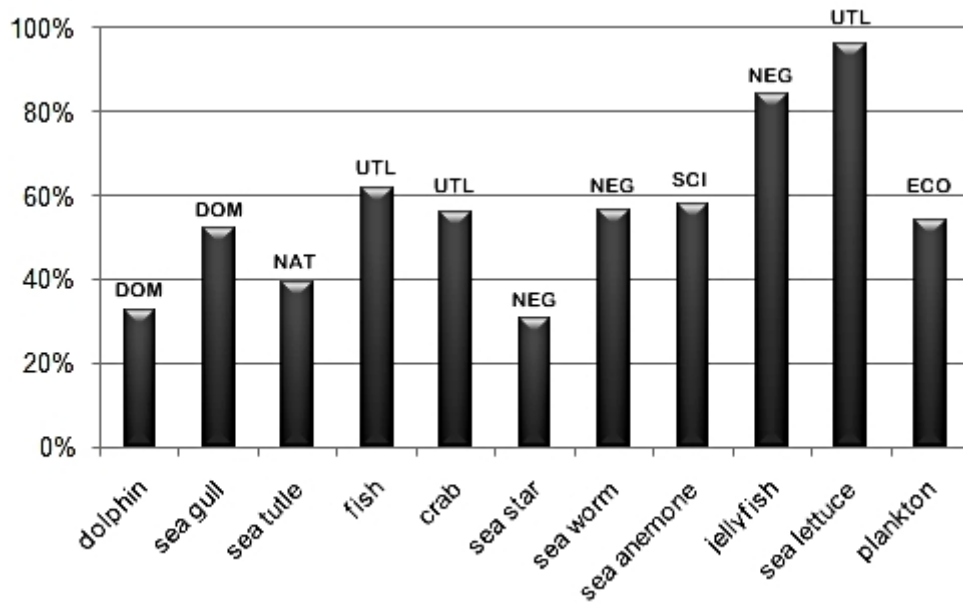
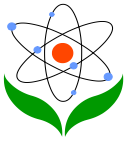
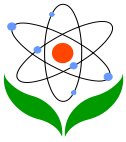


Figure 4. The most prominent value of each marine organism.

The following excerpts are representative of the students' Biophilic Typology toward marine organisms.

- Humanistic: "Dolphin is very smart and friendly to human."
- Moralistic: "I heard that sea turtle sometimes eat a plastic bag and die because of it."
- Scientific: "...if one arm of a sea star is removed, it can grow again. It is very different from humans"
- Ecologistic: "Planktons are very important in marine ecosystem, because they feed small fish which feed bigger fish that feed human beings."
- Naturalistic: "I haven't seen tiny plankton and I want to observe it using a microscope."
- Aesthetic: "Sea star has beautiful shapes and colors. I saw a blue one with red dots on it"
- Utilitarian: "My family eats cod, mackerel, and other fishes quite often and we like it."



- **Dominionistic:** “I really enjoyed a dolphin show at the zoo. It was fantastic”
- **Negativistic:** “I am afraid of jellyfish because they have poisonous sting.”

The students’ highly utilitarian values of ‘fish’, ‘crab’ and ‘sea lettuce’ are possibly related to Korean food culture. For example, ‘sea lettuce’ could be closely related to the students’ ecologicistic value because it is a basic producer in the marine ecosystems. Yet 96% of the students indicated a utilitarian value and noted their experiences with sea lettuce as food. In addition, 62% and 56% students demonstrated their utilitarian values of fish and crab respectively mentioning their personal seafood experiences. This result shows that food culture possibly affects and reflects the students’ perspectives of the value of nature, and that values are socioculturally mediated (Kahn, 2002; Kellert, 1996; Ulrich, 1993).

Regarding negativistic values of marine organisms, ‘jellyfish’ was perceived as a dangerous animal by 84% of students. Although sea worms do not inflict serious harm upon humans (some species do have jaws and can deliver a painful nip), more than fifty percent of the students showed negativistic value toward ‘sea worm’, possibly due to the animal’s body shape and negative aesthetic appeal (Kellert, 1996). Since values are crucial and functional in attitude formation and behavior development (Milfont, Duckitt, & Wagner, 2010; Vaske & Donnelly, 1999), the students’ negativistic and utilitarian value of marine organisms may not provide a substantive foundation for related responsible environmental action.

Conclusion

This exploratory study presents a snapshot of sixth grade Korean students’ previous experiences with, their awareness of connectedness to, and their perceptions of valuing marine organisms. The participating students, who were from middle class families living in the urban city of Seoul, demonstrated that they have limited experience with relatively small (but common) organisms such as sea lettuce, plankton, sea worm, and sea anemone. The students revealed a strong connectedness with fish and crab in particular, and their prominent perception of valuing each of these organisms was utilitarian. That is, the Korean students are generally connected to marine organisms through utilitarian perspectives and not through aesthetic perspectives.



This tendency can possibly be explained by the fact that their exposure to marine organisms in the dietary aspect of the culture is strongly utilitarian (i.e., frequently purchasing fish and crab at the supermarket and enjoying various kinds of seafood). The urban students' relatively low aesthetic perspectives are likely to result from the lack of opportunities to appreciate the beauty of the wildlife in their natural settings. The students live in a heavily urban environment, often in high-rise residential towers, and their day to day lives as young cosmopolitan citizen in modern society is very disconnected from the natural environment. In an attempt to substitute for declines in direct encounters with wildlife in the natural habitats, modern urban society provides increasingly naturalistic exhibits and diverse educational programs at zoos and aquariums. However, the roles of marine aquariums in Korea are more focused on entertainment than education (Kim, 2012), which is likely to have limited impact on the development of the urban students' aesthetic perspectives. As such, enhancing and emphasizing the role of aquariums as sites for marine environmental education, as they are in North America (Wagner, Becker, & Fulk, 2011), is very worthy of consideration to facilitate the urban students' connectedness to and more balanced values of marine organisms.

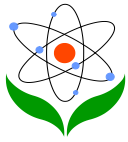
Given that students' attitudes toward living organisms are influenced by their beliefs, feelings, and experiences (Olson & Kendrick, 2008), educators should provide more balanced cognitive, affective, and behavioral experiences with marine plants and animals. Also developing a sense of connectedness to nature provides a base for developing environmental ethics and should be stressed in environmental education (Snively, 2007) to cultivate environmental literacy, defined by Roth (1992) as an "understanding of nature and interactions between human social systems and other natural systems" (p. 18). In this sense, facilitating awareness of connectedness to marine organisms is essential to increasing children's ocean literacy, which is critical to establishing desirable human-nature relationships and ultimately a more sustainable understanding of and related advocacy for the Earth.

As this study was conducted with a limited number of urban school students in Korea, the outcomes may not be extrapolated entirely to other case contexts beyond Korea or urban centers but possibly to learners with similar cultural backgrounds. However, we anticipate that our findings may provide a starting point for additional studies and discussions on Asian students' perceptions of, their connectedness to, and their values of the ocean realm and its inhabitants.

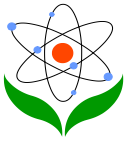


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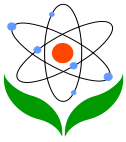
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