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Contrast between Concepts to Promote Students' Awareness
of Environmental Ethics in Biological Education:
Focusing on the Concept of Deep Ecology and Biophilia

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Contrast between Concepts to Promote Students' Awareness of Environmental Ethics in Biological Education: Focusing on the Concept of Deep Ecology and Biophilia

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1. Introduction

In Japan, environmental education to nurture love and awe for nature has been promoted based on a view of nature specific to Japanese people, who have inherited a culture and tradition nurtured through harmony and fusion with nature (Environment Agency, 1988; National Institute for Environmental Studies, 2014). In recent years, arguments and practices in deep ecology education—or education in environmental ethics that introduces the perspective of deep ecology—have developed a representative idea of environmental ethics that incorporates the aforementioned Japanese view of nature in its core idea, especially in the US, Canada, and Australia (for example, Rainforest Information Centre, 1998; Center for Ecoliteracy, 1998; Aspen Center for Environmental Studies, 2007). The idea of deep ecology asserts necessity of changes in inner awareness in order to reach a fundamental solution to environmental problems, with “self-realization” as its core idea (Naess, 1982; Morioka, 1995). Self-realization in terms of deep ecology entailed the enlargement of one’s inner self, promotion of identification with nature, and reexamination of one’s view of nature through the perception of richness and diversity, leading to a love for nature as a result (Naess, 1987, 1989). Setting this idea of self-realization as the cornerstone of its educational goal, deep ecology education introduces empirical field programs into its curriculum to enable students to experience identification with nature (Yamamoto, 2008). The idea of deep ecology has also been introduced into the US Biological Sciences Curriculum Study (BSCS), which is well known worldwide (BSCS, 2006).

Meanwhile, as deep ecology education has developed, another idea called biophilia has been advocated in the US. In recent years, discussions and practices in biophilia education—or environmental education that introduces the idea of biophilia—have been developed in the US and Canada, especially in the field of biology education (for example, Orr, 2005; Reece et al., 2011). According to E. O. Wilson, a sociobiologist and advocate of biophilia, the term refers to the “innate tendency to focus on life and lifelike processes,” which fosters deeper ethics regarding nature preservation. Also called the love of life, biophilia is considered a strong motivator for environmental ethics in preserving biodiversity among students (Wilson, 1984). This idea is included in a unit of *Campbell Biology*, a textbook adopted by universities worldwide and designated as an international standard textbook by the International Biology Olympiad for high school students (Reece et al., 2011).

These two ideas, deep ecology and biophilia, share many features, as they allow for advocacy of improvement in the awareness of environmental ethics through an enhanced “love for nature” and have been introduced into environmental education, especially in the field of biology. The present author has conducted

practical research on of deep ecology education in high school biology education (Yamamoto, 2010, 2016). The research focused on case-oriented practice for a specific high school students in a specific area, but the students' awareness of environmental ethics was improved. However, students who showed improvement in awareness of environmental ethics exhibited partial behavioral change in this regard, which was a problem. Therefore, the development of environmental education that further raises awareness of environmental ethics leading to behavioral change by focusing on the linkage between deep ecology and biophilia is needed. However, both deep ecology education and biophilia education have developed separately thus far, as no shared educational theories introduce both ideas. The only exception is the theory of ecological literacy, which introduces the idea of biophilia explicitly but deep ecology implicitly without illuminating any contrasts or relevance between them (Orr, 2005). Therefore, this research contrasts the concepts of deep ecology and biophilia, which are treated as concepts to promote students' awareness of environmental ethics in environmental education, especially biological education, in order to clarify their similarities and differences. Based on this comparison, this research aims to note several viewpoints to consider in developing environmental education to strongly foster awareness of environmental ethics that may lead to behavioral change in biological education.

2. Contrasting viewpoints between both concepts

Both deep ecology and biophilia are environmental philosophies, and there are similarities and differences between them in terms of their basic principles dissemination, t of philosophy/biology, dissemination of concepts, introduction into environmental education, development, and so forth. In this research, both concepts are contrasted, with respect to these similarities and differences, with a focus on the basic principle of the concept "love for nature." The aim to improve the awareness of environmental ethics through an increase in "love for nature" is the most common principle of both concepts. However, most notably, there are differences between these concepts concerning the scope of "love for nature," the process of occurrence of "love for nature," and the actual occurrence of "love for nature." Therefore, in this study, these three points used to contrast the two concepts.

In contrasting the concepts, reference is made to major papers, writings, and literature examining the concepts of deep ecology and biophilia. For deep ecology, the following documents are used: "*The Shallow and the Deep, Long-Range Ecology Movement. A Summary*" (a paper from the Norwegian philosopher Arne Naess, an advocate of this concept, who reported about deep ecology for the first time in 1973), "*Simple in Means, Rich in Ends*" (an interview article of Naess in 1982), "*Self-realization*" (records of Naess's lecture in 1995), "*Ecology, Community & Lifestyle*" (Naess's English book with translation and editing by Rosenberg in 1989), "*Deep Ecology*" (the book of Deval and Sessions, who directly inherited the philosophy of Naess), "*Toward a Transpersonal Ecology*" (Fox's book, which also directly inherited the philosophy of Naess). For biophilia, the following documents are used: "*Biophilia*" (a work in which Wilson first published the concept in 1984), "*The Biophilia Hypothesis*" (a work in which twenty researchers, including Wilson, reported the results of investigating theoretical and empirical evidence of biophilia, published in 1993), and "*Naturalist*" (Wilson's book published in 1994).

Environmental ethics does not represent one concept or idea; rather, it refers to the environmental ethics that appeared in the 1970s in the West, especially the United States, and the whole of environmental ethics derived and developed diversely therefrom. In addition, environmental ethics is regarded as a category of environmental philosophy. In this research, environmental ethics is defined as "questions concerning how people interact with nature as environmental problems become more serious" (Iwasa, 2008; Kato, 1991). This view is

shared in the main literature on environmental ethics. However, because there are similarities and differences in the emphasis of environmental ethics that is promoted in deep ecology and biophilia, together with the above three perspectives, the emphasis on environmental ethics is also a point of contrast.

Currently, environmental education in Japan is promoted in a comprehensive form that conforms to the international trend of education for sustainable development (ESD), the core idea of which is the anthropocentric view that the natural environment should be ultimately preserved for human beings (Yoshida, 2013). However, the Japanese version of ESD simultaneously aims to nurture a sense that human beings are also a part of nature. This is a very Japanese view of nature that emphasizes harmony between nature and human beings (National Institute for Environmental Studies, 2012), which corresponds to the idea that environmental ethics advocates the preservation of nature for natural objects, especially in deep ecology (Morioka, 1995).

3. Basic principle of both concepts regarding “love for nature”

3.1. Basic principle of deep ecology regarding “love for nature”

In deep ecology, the basic principle strongly related to “love for nature” is “self-realization,” which is the core of this concept. As mentioned above, self-realization in terms of deep ecology refers to the enlargement of one’s inner self, promotion of identification with nature, and reexamination of one’s view of nature through the perception of richness and diversity, leading to a love for nature as a result (Naess, 1989,1995). Therefore, self-realization is achieved, and a “love for nature” naturally arises. Hence, what is the scope of “nature” in deep ecology? Naess says the following about the scope of nature:

Now it is the time to *share* with all life on our maltreated Earth through the deepening identification with life forms and the greater units, the ecosystems, and Gaia, the fabulous, old planet of ours (Naess, 1995).

From this, it can be seen that “nature” includes not only the all life on the Earth but also the whole system called the ecosystem including the abiotic environment, such as air, water, and land, and even all the Earth (Gaia). Hence, what kind of process does self-realization that generates “love for nature” go through? The summary of self-realization explained by Naess is shown in Table 1.

Table 1 Self-Realization (Naess, 1995)

(1) We under-estimate ourselves. I emphasize ‘self.’ We tend to confuse it with the narrow ego.
(2) Human nature is such that with sufficient all-sided maturity we cannot avoid “identifying” ourselves with all living beings, beautiful or ugly, big or small, sentient or not.
(3) Traditionally, the <i>maturity of the self</i> has been considered to develop through three stages, from ego to social self, comprising the ego, and from there to the metaphysical self, comprising the social self. However, nature is then largely left out in the conception of this process. Our home, our immediate environment, where we belong as children, and the identification with human living beings, are largely ignored.
(4) Joy of life and the meaning of life are increased through increased self-realization.
(5) Because of an inescapable process of identification with others, with growing maturity, the self is widened and deepened.
(6) A great challenge of today is to save the planet from further devastation that violates both the enlightened self-interest of humans and non-humans and that decreases the potential of joyful existence for all.

As shown in Table 1, self-realization is achieved with a long span of “human maturity,” where identification with familiar people and the environment occurs through stages. Naess states that paradigm situations that are those in which individuals intensely empathize and identify with other beings. Specifically, he exemplifies his experience of identifying himself as a flea. In this regard, he experienced painful compassion and empathy when he accidentally saw a flea jumping into acid chemicals: “I see myself in the flea.” However, he said, “we need the immense variety of sources of joy opened through increased sensitivity towards the richness and diversity of life, landscapes of free nature” (Naess, 1995). Therefore, it is clear that he emphasizes the nature experience as a general situation in nature. Naess introduces Norway’s “friluftsliv” as a way of living that effectively promotes self-realization. “Friluftsliv” is an outdoor recreation activity that seeks to approach nature according to the conditions of nature itself. He says that “friluftsliv” will nurture the ability to experience deep, rich, and diverse relationships with nature (Naess, 1989). From the above, it is clear that self-realization goes through the process of being achieved by accumulating identity with nature through outdoor experiences that offer a sense of the richness and diversity of life. Then, what kind of love will be caused by self-realization? Naess explains this as follows.

We need environmental ethics, but when people feel that they unselfishly give up, even sacrifice, their interest in order to show love for nature, this is probably a treacherous basis for conservation in the long run. Through identification, they may come to see their own interest served by conservation, through genuine self-love—love of a widened and deepened self (Naess, 1995).

Naess says that behavioral changes will appear naturally by achieving such self-realization. He explains that as such self-realization progresses, behavioral changes will appear naturally, without depending morality or ethics, and will rather take on beautiful behavior (Naess, 1995). However, Fox says that this identity should not be taken in the sense that “I am literally that tree over there,” for example. According to him, what is being emphasized is the tremendously common experience that through the process of identification, my sense (my experiential self) can expand to include the tree even though I and the tree remain physically “separate” (Fox, 1990). Therefore, “love for nature” can be said to be a love that naturally arises when widening the sense of self to nature connected to the self.

Environmental ethics with the aim of nurturing “love for nature” is characterized in the basic principle of deep ecology that both Ness and Sessions establish (Table 2). Column(1) in Table 2 shows another core concept, “biocentric equality.” “Realization of these values” in column(2) refers to the self-realization of each of the various life forms (Naess and Sessions, 1985). From these basic principles, it turns out that deep ecology includes social, economic, and political problems in the ethical norms.

Thus, the characteristics of the basic concept of “love for nature” in deep ecology are summarized as follows. “Love for nature” in deep ecology covers not only all life on the Earth but also all systems called ecosystems, including the atmosphere, water, land, and other abiotic environments—the entire Earth. In the process of developing a “love for nature,” the sense of self is disseminated and deepens by feeling the richness and diversity of nature through experiences with outdoor nature, where one can identify one-self and other life forms. “Love for nature” is also recognized as a self-love. Through this process, self-maturity—that is, “self-realization”—progresses. “Love for nature” is a love that naturally arises when we disseminate our sense of self to nature connected to ourselves. Moreover, environmental ethics, as expected to be nurtured in deep ecology, constitutes the core of the “life-centered” nature of the “love for nature.”

Table 2 Basic principles of deep ecology (Naess and Sessions, 1985)

(1) The well-being and flourishing of human and nonhuman life on Earth have value in themselves (synonyms: intrinsic value, inherent value). These values are independent of the usefulness of the nonhuman world for human purposes.
(2) Richness and diversity of life forms contribute to the realization of these values and are also values in themselves.
(3) Humans have no right to reduce this richness and diversity except to satisfy <i>vital</i> needs.
(4) The flourishing of human life and cultures is compatible with a substantial decrease in the human population. The flourishing of nonhuman life requires such a decrease.
(5) Present human interference with the nonhuman world is excessive, and the situation is rapidly worsening.
(6) Policies must therefore be changed. These policies affect basic economic, technological, and ideology structures. The resulting state of affairs will be deeply different from the present.
(7) The ideology change is mainly that of appreciating life quality (dwelling in situations of inherent value) rather than adhering to an increasingly higher standard of living. There will be a profound awareness of the difference between big and great.
(8) Those who subscribe to the foregoing points have an obligation to directly or indirectly try to implement the necessary changes.

3.2. Basic principle of biophilia regarding “love for nature”

As biophilia can be paraphrased as “love of life,” its basic principle is related to “love for nature” as a whole. As mentioned earlier, the definition of biophilia by Wilson is an “innate tendency to focus on life and lifelike processes” (Wilson,1984). According to him, biophilia has an innate and close relationship in terms of the living organisms and emotions of humans (Wilson,1993). Regarding “lifelike processes,” the concept is supplemented by environmental researcher Kellert as “ecological function and structure” (Kellert, 1993). Therefore, “love for nature” in biophilia concerns love for all living beings, and it is thought that ecosystems are included therein.

Hence, in what process will “love for nature” occur? Before offering an explanation, it is necessary to explain biophilia. Wilson, in his book “*Biophilia*,” describes the experience of recalling biophilia. During an ecological survey in South America’s rainforest Surinam, the emotion of love for the forest’s life roared when he reached the “naturalist’s trance” state in a small vacant land in the forest. He later made a kind of intelligent reasoning regarding this event and summarized the subject of reasoning with the word “biophilia.” Moreover, his reasoning leads to the theory of “gene-culture coevolution” that biology and culture are bridged in a dramatic way, as represented by what should be called “snake phenomena” (Wilson,1984). Wilson’s hypothesis on the “snake phenomenon” is noted below.

Here then is ophidian version of the biophilia hypothesis expressed in briefest form: constant exposure through evolutionary time to the malign influence of snakes, the repeated experience encoded by natural selection as a hereditary aversion and fascination, which in turn is manifested in the dreams and stories of evolving cultures. I would expect that other biophilic responses have originated more or less independently by the same means but under different selection pressures and with the involvement of different gene ensembles and brain circuitry (Wilson, 1993).

Wilson reasons that biophilia has an ambivalent tendency to be hated and fascinated, as seen in the “snake phenomenon,” which is expressed as a result of the biocultural evolution. Therefore, it is noted that biophilia may express not only loving feelings but also negative feelings for certain living organisms as a coin. Wilson reasons about the process that biophilia occurs as follows.

Biophilia, like other patterns of complex behavior, is likely to be mediated by rules of prepared and counter-prepared learning—the tendency to learn or to resist learning certain responses as opposed to others. From the scant evidence concerning its nature, biophilia is not a single instinct but a complex of learning rules that can be teased apart and analyzed individually (Wilson, 1993).

According to Wilson, such learning rules are handed down from generation to generation in the form of the “gene-culture coevolution” mentioned above. These learning rules can be inaugurated and fine-tuned by adjustment sensory thresholds—by a quickening or blockage of learning and by modification of emotional responses. That is, key stimulation causing biophilia is said to be activated by the process of showing love or evasion to nature.

Thus, how does such a love or evasion reaction draw out? The mechanism is further clarified in a study that attempts to verify the biophilia hypothesis described below. Kellert finds nine types of biophilic values based on survey results on human perceptions of various animal classification groups and summarizes the results as shown in Table 3.

Table 3 A Typology of Biophilia Values (Kellert, 1993)

Term	Definition	Function
(1) Utilitarian	Practical and material exploitation of nature	Physical sustenance/security
(2) Naturalistic	Satisfaction from direct experience/contact with nature	Curiosity, outdoor skills, mental/physical development
(3) Ecologistic-Scientific	Systematic study of structure, function, and relationship in nature	Knowledge, understanding, observational skills
(4) Aesthetic	Physical appeal and beauty of nature	Inspiration, harmony, peace, security
(5) Symbolic	Use of nature for metaphorical expression, language, expressive thought	Communication, mental development
(6) Humanistic	Strong affection, emotional attachment, “love” for nature	Group bonding, sharing, cooperation, companionship
(7) Moralistic	Strong affinity, spiritual reverence, ethical concern for nature	Other and meaning in life, kinship and affiliation ties
(8) Dominionistic	Mastery, physical control, dominance of nature	Mechanical skills, physical prowess, ability to subdue
(9) Negativistic	Fear, aversion, alienation from nature	Security, protection, safety

This survey is conducted in the United States, Japan, Germany, and Botswana, but it appears in various contexts, such as taxonomy, behaviorism, demographics, history, and culture. Kellert notes that these nine types are likely to fully reflect the universal and functional expressions of our species' dependence on the natural world. In addition, he notes, "It appears that a variety of basic valuations of nature are consistent with the possibility of increased evolutionary fitness at both the individual and species levels" (Kellert, 1993). In other words, these nine types are inherently acquired as a result of adaptive evolution to nature. In addition, the environmental psychologist Ulrich offers the following hypothesis regarding the occurrence of biophilia:

If biophilia is represented in the gene pool, it is because a predisposition in early humans for biophilic responses to certain natural elements and setting contributed to fitness or chances for survival. A basic conceptual argument in this chapter is that both the *rewards* and the *dangers* associated with natural settings during human evolution have been sufficiently critical to favor individuals who readily learned, and then over time remembered, various adaptive responses—both *positive/approach* (biophilic) responses and *negative/avoidance* (biophobic) responses—to certain natural stimuli and configurations (Ulrich, 1993).

Ulrich examined such a hypothesis using a psychological method and, based on the results, inferred that the genetic contribution of biophilia is within the range of 20 to 40%. In addition, regarding the process of biophilia development, the author made the following, conclusion.

The theoretical propositions advanced here imply that partly genetic biophilic responses should not appear spontaneously or in the absence of learning; rather, some learning or conditioning is necessary for acquiring biologically prepared positive responsiveness, which is then marked by persistent retention. There is certainly no suggestion here that biophilia might be genetic in any deterministic or overriding sense. Learning is required for acquiring a positive response that is only partly predisposed by genetic factors, and the response is modified by conventional learning, experience, and culture (Ulrich, 1993).

From the above, biophilia is activated by some kind of natural stimulus, partly by acquiring positive responses from genetic factors, but learning is necessary to acquire it. In addition, the opinion that affirmative responses are influenced by culture and experience is shown.

Environmental ethics, which aim at nurturing through "love for nature," is clearly a human-centered position based on Kellert's type (Table 3) and Wilson's argument. Wilson argues that the only way to make the ethics of nature conservation actually work is to position it thoroughly within selfish logic. However, he supplements this argument with the premise that doing so is something completely new and more persuasive. Regarding Stone's question "Should trees have standing?", Wilson does not agree with Stone's idea that legal rights should be applied to non human living things and the entire environment, but he says that there should be serious discussion in this regard. This shows that Wilson also needs to consider environmentalist positions. He said, "To see the deepest part of the motivation for nature conservation, to understand why we love life and protect, what conditions it faced under any circumstances" (Wilson, 1984). In addition, he refers to the relationship between human and nature as follows:

In my opinion, the most important implication of innate biophilia is the foundation it lays for an enduring conservation ethic. If a concern for the rest of life is part of human nature, if part of our culture flows from

wild nature, then on that basis alone it is fundamentally wrong to extinguish other life forms. Nature is part of us, as we are part of nature (Wilson, 1994).

It is clear from the above that biophilia is included as an element in the environmental ethics that Wilson sought. In addition, it has become clear that we focus on the deep recognition that human beings are part of nature—while thoroughly remaining human centered.

Thus, the characteristics of the basic concept of “love for nature” in biophilia are summarized as follows. “Love for nature” in biophilia is targeted for all life and ecosystems including within it. The process of the occurrence of “love for nature” is the acquisition of positive responses with genetic factors, in part, by certain natural stimuli. Moreover, to acquire it, learning is necessary, and positive reactions are influenced by culture and experience. “Love for nature” means biophilia itself. However, it is classified into nine types: utilitarian, naturalistic, ecologicistic=scientific, aesthetic, symbolic, humanistic, moralistic, dominantistic, and negativeistic. There is also biophilia that has an ambivalent tendency to be positive and negative. In addition, although environmental ethics that aims biophilia is human centered, it also includes recognition that people are part of nature.

4. Contrasting between both concepts

Regarding deep ecology and biophilia, the basic principle of the concept of “love for nature” has been contrasted. In this regard, four viewpoints were contrasted: the scope of “love for nature,” the process of the occurrence of “love for nature,” the occurrence of “love for nature,” and the emphasis of environmental ethics aimed at nurturing in both concepts.

First, the scope of nature in “love for nature” was contrasted. What is common to both concepts is that all systems of life forms and the ecosystem, including the abiotic environment surrounding it, are the object of love for nature. This is considered to be due to the fact that both concepts are basic principles in the premise of the importance of the value of biodiversity. Therefore, both concepts are common in that they emphasize the value of biodiversity in ecosystems. However, while deep ecology broadly includes the scope of coverage throughout the Earth, biophilia is the only system that constitutes a whole system called an ecosystem, which is the difference between the two concepts.

Next, the process of the occurrence of “love for nature” is contrast between the two concepts. The common points of the process are reflected in the following four points: occurrence is not voluntary, the triggering factors are necessary, the chance is a nature experience, and a positive sensation/reaction occurs after further processing. However, there are many differences with respect to the process. First, the cause of the positive sensation/reaction is different. Regarding this factor, deep ecology is caused by expansion of self-sensation, but biophilia is caused by mainly genetic factors. Deep ecology also considers this process to be “self-maturity,” but there is a difference in that biophilia relates to a “learning reaction” with genetic factors.

Next, the “love for nature” that occurs through the above process is contrasted. In this regard, in contrast to the process, the common point is that both concepts recognize “love for nature” as a positive reaction. However, differences were seen in details regarding how to gain “positive” reactions. Specifically, in the case of deep ecology, a positive feeling toward nature increases as self-love expands through the process of identification. Rather, it is limited to a part of the nine value types of biophilia, primarily regarding naturalistic and moralistic reactions. The nine types include negative reactions. In addition, from the standpoint of deep ecology, shallow thoughts on solutions to environmental problems and utilitarian and dominant responses that are regarded as

human-centered concepts are included. Therefore, both concepts are common in that they capture the “love for nature” as a naturalistic, moralistic reaction with respect to the type of biophilia.

Finally, the emphasis of environmental ethics, which aim to be promoted with both concepts, is contrasted. Deep ecology stands in the position of environmentalism—that is, human non-centricism—as indicated by the clear ethical norms. On the other hand, the ethical norms of biophilia are not clear. Moreover, as evidenced by the selfish logic due to genetic factors, biophilia also includes a human-centric position. Thus, the position regarding environmental ethics differs between the two concepts. However, the view that humans are part of nature and that environmental ethics prevent the loss of biodiversity caused by environmental destruction is importantly is common between the two concepts. Therefore, since both concepts offer different positions, they seem to be confrontational in a binary sense at first glance, but they are show commonalities in that they emphasize the recognition the concept that “human is part of nature.”

5. Conclusions

Based on the contrasting results between these two concepts, the following viewpoints in developing environmental education to strongly motivate awareness of environmental ethics that leads to behavioral change in biological education can be noted. First, both concepts target environmental ethics, including overall life: thus, the introduction of biological education into the ecology field may increase the awareness of environmental ethics. In particular, the scope of consciousness regarding environmental ethics will be broader for deep ecology, which is the subject of environmental ethics regarding the entire Earth. Second, both concepts are expected to raise awareness of environmental ethics through the introduction of nature experience learning for biological education, as natural experiences trigger “love for nature” as a positive sensation/response. In particular, deep ecology strongly motivates the awareness of environmental ethics by aiming for identification with nature that matches itself, in nature (Yamamoto, 2010, 2016). In addition, by activating biophilia, which primarily relates to genetic factors by nature experience, the awareness of environmental ethics is strongly motivated. However, as noted with respect to the nine types of biophilia values, the resulting “love for nature” also includes utilitarian, dominantistic, and negative reactions. As a third point, both concepts emphasize the recognition of the “human part of nature,” so the concept of the “human part of nature,” which is a value aimed at nurturing in ESD in Japan, is common. However, the concept of the “human part of nature” in deep ecology is a concept of “life-centered equality” and deeper respect for other lives.

Several viewpoints to be considered have been noted, but the following consideration is necessary. In the ecology field of biological education, it is necessary to further introduce the viewpoints that are common to both concepts, the kinds of behavioral change that are likely to be introduced through its introduction, and the kinds of introduction methods that are effective.

In the future, I would like to explore the preceding practical research on biophilia education and to explore concrete learning contents of biology, as well as the basic principles of both concepts through a comparison with deep ecology teaching. In addition, I would like to examine how to effectively acquire genetic factors and specific response to negative reactions to specific organisms. I would also like to conduct a conceptual and practical examination of environmental education practice based on such factors.

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This research makes a contrast between the concepts of deep ecology and biophilia, which are treated as concepts to promote students' awareness of environmental ethics in environmental education, especially biological education, to clarify their similarities and differences. Accordingly, this research is aimed at highlighting several viewpoints to consider in developing environmental education to strongly motivate awareness of environmental ethics that will lead to behavioral changes in biological education.

Regarding deep ecology and biophilia, the basic principle of the concept of "love for nature" was contrasted. In this way, four viewpoints were contrasted: scope of "love for nature," the process of generation of "love for nature," occurrence of "love for nature," and emphasis on environmental ethics aimed at nurturing both concepts. Moreover, several viewpoints to consider were noted as follows.

Both concepts target environmental ethics including overall life, so introducing biological education into the ecology field may increase the awareness of environmental ethics. However, deep ecology covers the entire Earth and is broad in scope. Both concepts are expected to raise awareness of environmental ethics through the introduction of learning from experiences with nature for biological education, as natural experiences trigger "love for nature" as a positive sensation/response. However, it should be noted that the resulting "love for nature" also includes utilitarian, dominionistic, and negative reactions. Both concepts emphasize the recognition of the "human part of nature," and thus the concept of the "human part of nature," which is a common value in Japan aimed at nurturing ESD.

生物教育における生徒の環境倫理意識の育成を促す概念の対比 ディープ・エコロジーとバイオフィリアの概念に着目して

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本研究では、環境教育、特に生物教育における環境倫理意識の育成を促す概念として扱われているディープ・エコロジーとバイオフィリアの概念の対比を行い、それらの共通点、差異点を明らかにし、それに基づき、生物教育において、行動変革まで結びつくような環境倫理意識を強く動機付けるための環境教育を開発するに当たって検討すべきいくつかの視点を指摘することを目的とした。

ディープ・エコロジーとバイオフィリアの「自然への愛」に関する概念の基本原理に絞って両概念の対比を行った。その際、両概念の対象とする自然、「自然への愛」が発生するプロセス、生じる愛、育成を図っている環境倫理の重点、という4視点で対比した。そして、検討すべきいくつかの視点を次のように指摘した。

両概念とも、全生命を含む生態系を環境倫理の対象としているため、生物教育の生態分野の学習への導入により、環境倫理意識が高まる可能性がある。しかし、ディープ・エコロジーの対象範囲は、地球全体まで含み、広い。両概念とも、自然体験をきっかけとして、肯定的な感覚・反応としての「自然への愛」が発生するため、生物教育に自然体験学習の導入による環境倫理意識向上が期待される。

しかし、生じる「自然への愛」には、功利主義的、支配主義的、そして否定的な反応も含まれるという点を留意する必要がある。両概念とも「人は自然の一部」という認識を重視しているため、日本のESDでの育成が目指される価値観である「人は自然の一部」という概念と共通する。

