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Children's Moral and Ecological Reasoning About the Prince William Sound Oil Spill

Peter H. Kahn, Jr.
Colby College and The Mina Institute

Sixty 2nd, 5th, and 8th graders were interviewed on their moral and ecological reasoning about the 1990 Exxon Valdez oil spill that occurred in Prince William Sound, Alaska. Results showed that children understood that the oil spill negatively affected the local Alaskan shoreline, marine life, fishermen, recreationists, and the oil company. Children cared that harm occurred to the shoreline and marine life and conceived of both types of harm as violating a moral obligation. Fifth and 8th graders, compared with 2nd graders, used a greater proportion of anthropocentric reasoning (e.g., that nature ought to be protected to protect human welfare) and biocentric reasoning (e.g., that nature has intrinsic value, rights, or a teleology). Discussion focuses on how studying children's reasoning about nature not only extends the bounds of what counts as moral—to include a relationship with the natural world—but also provides a unique means by which to conduct basic research on children's moral development.

On March 24, 1989, the Exxon Valdez supertanker ran aground in Prince William Sound, Alaska. The tanker's hull ruptured, and nearly 11 million gallons of crude oil spilled into the Sound. This oil spill has been the largest one to occur in North America and the most destructive single event of oil pollution in North American history (Keeble, 1993). Although the full effects are still hotly contested, it appears that this oil spill killed thousands of marine mammals and more than a quarter of a million birds, deposited over 1 million gallons of oil on beaches and shoreline, harmed the ecosystem of the Sound for at least decades, harmed the subsistence livelihoods of Native Americans, led to potentially long-term psychological disorders of residents within local communities, and resulted in many billions of dollars of economic damage (Gilardi, 1994; Holloway, 1991; Keeble, 1993; Pain, 1993; Palinkas, Petterson, Russell, & Downs, 1993).

Environmental disasters of this magnitude capture the attention of millions of people. They also shape social discourse and environmental practice for years to come. However, little is known about how such disasters affect the reasoning and values of children at large. Thus, approximately 1 year after this oil spill occurred, I interviewed 60 children about their moral and ecological reasoning about the Prince William Sound oil spill. I expected that the results would contribute to (a) the moral developmental literature and (b) an emerging line of developmental research on children's concepts and values of the natural environment (Beringer, 1994; Biaggio, 1994; Cohen & Horm-Wingerd, 1993; Hickling & Gelman, 1995; Kahn, 1997; Kahn & Friedman, 1995; Simmons, 1994).

Method

Participants

Sixty children were interviewed, 20 children in each of three grade levels: second (*M* age was approximately 8 years 6 months, 10 girls and 10 boys), fifth (*M* age = 11 years 7 months, 12 girls and 8 boys), and eighth (*M* age = 14 years 5 months, 14 girls and 6 boys). The children were selected from two public schools in Houston, Texas. Children were from various ethnic backgrounds (particularly Caucasian, African American, and Asian American) and levels of economic standing (from lower-working class to upper-middle class).

Procedures and Measures

Each child was individually administered a semistructured interview that lasted approximately 40 min. The interview focused on four major areas.

First, children's understandings were assessed about the potentially harmful effects of the oil spill on the shoreline, marine life, fishermen, recreationists, and the oil company that accidentally spilled the oil (e.g., "How do you think the oil spill affected the local beaches and shoreline in Alaska?"). Other questions focused on whether, in the context of an oil spill, children valued shoreline and marine life ("Does it matter to you that because of the oil spill, oil covered hundreds of miles of beaches and shoreline?"). An additional value-oriented question focused on endangered species ("Do you know what an endangered species is? What? [If necessary, the interviewer explained to the child that it is when there are very few of one type of animal left in the world.] Let's say that some of the fish that died in the oil spill were from an endangered species, would this matter to you?"). A further question focused on whether harm to the marine life caused by human activity (transporting oil) differed from harm caused by other animals ("In nature, fish often

Peter H. Kahn, Jr., Education and Human Development Program, Colby College, and The Mina Institute, Covelo, California.

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Correspondence concerning this article should be addressed to Peter H. Kahn, Jr., Education and Human Development Program, Colby College, Waterville, Maine 04901. Electronic mail may be sent via Internet to phkahn@colby.edu.

eat other fish in order to live. Thus, in nature, many fish get killed. Is this different from fish dying in an oil spill? Why?").

Second, children's moral obligatory reasoning was assessed regarding the effects on both the shoreline and the marine life. This assessment of obligation drew on the moral-developmental literature (e.g., Kahn, 1992; Nucci, 1981; Smetana, 1995; Turiel, 1983, in press), wherein a moral obligatory judgment is prescriptive, not contingent on local cultural practices, rules, and laws, and generalizable to other people and to cultures with different practices, rules, and laws. Correspondingly, one question focused on whether the act was viewed prescriptively ("Is it all right or not all right that the oil spill covered hundreds of miles of beaches and shoreline in Alaska?"). A second question focused on whether the initial judgment was contingent on legal sanction ("Let's say the law said that it doesn't matter that beaches and shoreline get covered with oil, would it then be all right or not all right that beaches and shoreline got covered with oil in the Alaskan oil spill?"). A third question focused on the generalizability of the initial judgment ("Let's imagine that the oil spill happened in a different country a long ways away, and, in that country, people didn't care that oil covered their beaches and shoreline. Would it then be all right or not all right for their country that oil covered their beaches and shoreline?").

Third, children's justifications were elicited for 10 questions (discussed above): 3 that involved valuing nature (whether it mattered that harm occurred to shoreline, marine life, and endangered species), 1 that involved the cause of harm (if it mattered whether the death of marine life was caused by nonhuman or human agents), and 6 that involved the criterion questions for establishing the presence of moral obligatory reasoning about harm to the shoreline (3 questions that pertained to prescriptivity, rule contingency, and generalizability) and harm to marine life (the same 3 types of questions).

Fourth, children's conceptions of what it means to live in harmony with nature were assessed by asking (a) directly about this issue ("One student I talked with said that it was wrong for the oil spill to have occurred because it's important for people to live in harmony with nature. What does it mean to you to live in harmony with nature?"), (b) for a behavioral example ("Can you give an example of what it means to live in harmony with nature?"), and (c) how the children judge whether another person is living in harmony with nature ("How do you know if someone is living in harmony with nature?"). Extended dialogue and multiple reasons were encouraged.

Coding and Reliability

A coding manual was first developed from the responses of 50% of the children, a total of 30 children, with 10 children from each age group. The coding manual was then applied to all of the data. Three types of responses were coded: evaluations (e.g., *all right/not all right*, *matters/does not matter*, *harmed/not harmed*), justifications for evaluations (e.g., an appeal that animals have rights), and conceptions of living in harmony with nature (e.g., respect for nature). Parts of the justification coding system drew on coding systems developed by Howe, Kahn, and Friedman (1996) and Kahn and Friedman (1995). Summary descriptions, on the most general level, of the justification coding system are presented in Table 1, and those for the harmony conceptions coding system are presented in Table 2.

An independent coder trained in the use of the coding manual recoded 18 interviews (30% of the data), 6 randomly chosen from each of the three grade levels. In total, 342 evaluations, 234 justifications, and 28 harmony conceptualizations were recoded. Intercoder reliability was assessed through testing Cohen's kappa for statistical significance at the .05 level. All tests were statistically significant. Intercoder agreement was the following: For evaluations, 95% ($\kappa = .91$, $z = 18.18$); for justifications on the level reported in Table 1, 70% ($\kappa = .63$, $z = 20.19$); and for harmony conceptualizations on the level reported in Table 2, 82% ($\kappa = .59$, $z = 2.77$).

Results

Nonparametric tests were used for tests of statistical significance of some of the categorical data (see Marascuilo & McSweeney, 1977). Justification data were analyzed by first submitting them to arcsine transformations and then by performing multivariate analyses of variance (MANOVAs) and analyses of variance (ANOVAs). No gender differences were found, and thus gender data were collapsed. Age differences were found as reported.

Children's Understandings and Valuing Related to the Effects of the Oil Spill

The large majority of the children understood that the oil spill negatively affected the local Alaskan shoreline (75%, 95%, and 100% in Grades 2, 5, and 8, respectively), marine life (100%, 100%, and 100%), fishermen (95%, 100%, and 100%), recreational users (100%, 100%, and 100%), and the oil company (81%, 100%, and 100%). However, fewer effects were recognized by children in Grade 2 compared with those in Grades 5 and 8 for both the shoreline and the oil company. For the shoreline, $\chi^2(2, N = 58) = 7.35$, $p < .03$. For the oil company, $\chi^2(2, N = 55) = 7.73$, $p < .03$. Of the children who had recognized harm, the majority said that it would matter to them that harm occurred to the shoreline (79%, 100%, and 79%) and marine life (95%, 95%, and 95%). It also mattered to the children if the harm had occurred to an endangered species (78%, 95%, and 74%). Children also differentiated the death of fish caused by an oil spill and caused by other fish (90%, 95%, and 95%).

Children's Moral Obligatory Reasoning About the Oil Spill

The majority of children said that it was not all right that the oil spill harmed the shoreline and marine life (98% and 96%, respectively), that such harm would not be all right even if a law allowed for it (97% and 98%), and that it would not be all right even if it happened in a far-off place where people thought the act would be all right (89% and 82%). If one assesses moral obligation by means of a conjunction of all three criteria (prescriptivity, rule contingency, and generalizability), the results show that the majority of children viewed the act of polluting the shoreline (86%) and marine life (75%) as a violation of a moral obligation.

Pairwise comparisons with Fisher's exact test (at the .05 level) were then performed to test for developmental effects. Results showed that in comparison with the two older groups, the second graders less often conceived of harm to the environment in terms of a moral obligation: for shoreline, 61% (second), 100% (fifth), and 95% (eighth); for marine life, 40% (second), 94% (fifth), and 88% (eighth).

The moral quality of children's obligatory judgments is underscored by those justifications that appealed to welfare, justice, intrinsic value of nature, and unelaborated harm to nature. These justifications turn on considerations of justice, welfare, and virtue—issues that in moral philosophy traditionally come under the purview of morality. Accordingly, for children who provided

Table 1
Summary of Environmental Justification Categories

Category and type of response	Summary description
Anthropocentric	An appeal to how effects to the environment affect human beings
Personal interests	An appeal to personal interest and projects of self and others, including those that involve recreation or provide fun, enjoyment, or satisfaction ("[it matters] because they can't have their favorite food or do their hobby . . .")
Welfare	An appeal to the physical, material, and psychological welfare of human beings, including that of self, of other individuals, and of individuals within a larger systemic social context or ecological context ("it wouldn't be all right because like if it was in Australia or somewhere, it would eventually pass on to us and mess up, because we're all the world, you know, and it's going to eventually come to us")
Educative	An appeal to the potential for humans to learn from nature ("because if we lost the endangered species of the fish in the oil spill, we won't be able to learn physically and mentally from them")
Justice	An appeal to fairness or the rights of other humans, including a focus on locus of responsibility and unjustified harm (it's not all right because everyone has a right to work)
Aesthetics	An appeal to preserving the environment for the viewing or experiencing pleasure of humans ("because we might not see them beautiful fish no more if they were killed")
Biocentric	An appeal to a larger ecological community to which humans may be a part
Intrinsic value of nature	An appeal that nature has value that is derived not only from human interest, including a focus on biological life, natural processes, establishing value equivalencies between other life forms and humans ("because if it was human lives, then it would still be the same thing, it wouldn't be all right because it's lives"), or a teleos of nature ("without animals, the world is like incomplete, it's like a paper that's not finished")
Justice	An appeal that nature has rights or deserves respect or fair treatment ("it's not all right because I think every creature, people, or thing or whatever has a right to live"), including appeals to unjustified harm ("it's not all right that the oil spill killed many animals because I don't think it was their fault"), or established by means of a direct relation between humans and nature ("because I think fish and animals have a right to live just like we do, and it's not fair to have killed them this way"), a compensatory relation ("just because of their appearance and they can't talk, they're animals, and I don't think that's right, they could be people if they could talk, a form of people, well not human beings but something like it, just a degree of level and that's it, that's the only difference"), a conditional relation ("it's not all right because they're dead, living things just like we are, you wouldn't want anybody to kill you like that"), or a hypothetical perspective-taking relation ("you put yourself in the animal's position and you wouldn't like that, and so if you just kind of trade places and think about it, and everyone would think it wasn't right")
Unelaborated harm to nature	Although no reference is made to whether appeals for nature derive from an anthropocentric or biocentric orientation, such appeals include a focus on animals, nonliving parts of nature, food chains, and ecosystems ("it wouldn't be all right because if the animals die, the land wouldn't be fertilized to grow plants, and animals need plants to eat, and when the animals give out carbon dioxide, plants suck it in to make oxygen, and the animals need oxygen to live")

negative evaluations on all three criterion questions, an analysis was conducted that examined the percentage of children who provided moral justifications. For shoreline and marine life, the results showed that 96% and 100%, respectively, of the children provided a moral justification for at least one of their three evaluations (73% and 86% for two of the three and 50% and 56% for three of the three).

Children's Moral and Ecological Justifications

Children's justifications for their evaluative judgments were elicited for the 10 questions described in the Method section. The resulting justifications were coded with the categories reported in Table 1. The quantitative results are reported in Table 3, broken down by each of the 10 questions. The results from these 10 questions were then united in a single analysis to test for developmental effects.

The analysis proceeded as follows. First, the individual justification categories were collapsed into three: harm to nature, anthropocentric, and biocentric. Then, the mean proportionate use of each category was calculated by grade across all 10 questions. Results showed the following—harm to nature: 26% (second), 35% (fifth), and 22% (eighth); anthropocentric: 42% (second), 64% (fifth), and 58% (eighth); and biocentric: 8%

Table 2
Children's Conceptions for Living in Harmony With Nature—Summary of Categories

Category	Basis of conception
Possessing	Having or possessing aspects of nature ("[harmony means] flowers in your yard, a big house")
Acting upon	Doing something to or for nature, including positive and negative acts ("[harmony] would mean you're doing great with not littering, not polluting the air")
Experiencing	Experiencing or interacting with nature ("[to live in harmony] means to have the experience of coming in contact with nature; go in the woods and have an experience, like go out there for a couple of days—go camping")
Educative	Conception based on learning from nature ("[to live in harmony] means to learn from the animals; if we start to look at animals as an example, then maybe we can change ourselves")
State of mind	Experiencing a particular state of mind or feeling ("[you know someone is living in harmony with nature] by their expression toward life, how some people wake up in the morning and say, 'It's a glorious day,' they love that day, and they are happy")
Relational	Relationship between humans and nature (it's just like it's your only child you can have, you love your child, it's just like loving animals like dogs and all of that")
Respect for nature	Respecting nature ("[harmony] means to respect lower life forms and respect animals when you see animals")
Balance with nature	Being in balance with nature, through a sense of either proportion or equality ("it's important to keep the scales balanced, taking from nature small amounts, but putting back what you take")

(second), 26% (fifth), and 20% (eighth). These results were subjected to an arcsine transformation. Then, a MANOVA × Grade analysis was performed. An overall grade effect was found ($p < .001$). Subsequent F tests showed significant grade differences in two of the categories: anthropocentric, $F(2, 57) = 5.79$, $p < .01$, and biocentric, $F(2, 57) = 5.43$, $p < .01$. Subsequent t tests showed that, in comparison with the second graders, the fifth and eighth graders used a greater percentage of anthropocentric reasoning, $t(38) = 3.17$, $p < .01$, and $t(38) = 2.46$, $p < .02$, for second versus fifth and second versus eighth, respectively, and biocentric reasoning, $t(38) = 3.23$, $p < .01$, and $t(38) = 2.59$, $p < .02$, respectively.

Another statistical analysis compared whether children's justification use differed in reasoning about the shoreline and marine life. The four shoreline questions were combined, and mean proportionate justification use was calculated. The same procedure was used with the four marine-life questions. Matched-pair t tests were performed for each of the three overarching justification categories. Results showed that harm to nature was more often used for the shoreline (M use, 32%) than for the marine-life (22%) stimuli, $t(59) = 2.1$; $p < .04$. Similarly, anthropocentric was more often used for the shoreline (70%) than for the marine-life (50%) stimuli, $t(59) = 5.0$; $p < .001$. In contrast, biocentric was more often used for the marine-life (26%) than for the shoreline (4%) stimuli, $t(59) = 5.1$; $p < .001$.

Children's Conceptions of Living in Harmony With Nature

Children's conceptions of living in harmony with nature were coded with the categories reported in Table 2. On the basis of

Table 3
Percentages of Environmental Justifications by Question and by Category

Justification category	Shoreline				Marine life				Natural order: Eval.	Endang. species: Assess. of value
	Assess. of value	Act eval.	Rule conting.	General.	Assess. of value	Act eval.	Rule conting.	General.		
Anthropocentric										
Personal interests	23	18	18	10	18	6	10	7	4	9
Welfare	43	37	38	48	34	31	27	45	10	29
Educative	1	1	0	0	1	0	2	2	0	6
Justice	2	0	2	4	2	2	2	2	0	0
Aesthetics	6	4	3	6	7	6	3	0	2	14
Biocentric										
Intrinsic value	2	0	2	2	8	12	10	9	35	13
Justice	1	4	2	2	11	25	13	12	10	3
Harm to nature	20	37	37	28	18	17	34	24	39	26

Note. Percentages may not equal 100 because of rounding. Assess. = assessment; eval. = evaluation; conting. = contingency; general. = generalizability; Endang. = endangered.

pairwise comparisons with Fisher's exact test (at the .05 level), three developmental effects were found. First, in comparison with second and eighth graders, fifth graders more often conceived of harmony in terms of positive acts. Second, compared with second graders, eighth graders more often conceived of harmony in terms of experience with nature. Third, in comparison with second graders, fifth and eighth graders more often conceived of harmony in terms of "respect for nature" and "balance with nature" (which were grouped together for the statistical analysis).

Discussion

The results help reveal children's moral and ecological reasoning about the oil spill that occurred in Prince William Sound, Alaska. Results showed, for example, that most of the children understood that the oil spill negatively affected the local Alaskan shoreline, marine life, fishermen, recreationists, and the oil company. It also mattered to the children that harm occurred to the shoreline and marine life. Moreover, in consort with moral justifications, children's moral obligatory judgments were assessed with three criterion judgments: prescriptivity, rule contingency, and generalizability. Results showed that the majority of children—although less so for the children in Grade 2—conceived of the harm caused to the shoreline and marine life as a violation of a moral obligation.

Earlier research (see Kahn, 1997) had provided tentative support for the proposition that in the course of late childhood, biocentric reasoning arises through the hierarchical integration of anthropocentric reasoning. The present results only partially supported this proposition. In the proposition's favor, there were clear qualitative indications that biocentric reasoning often integrated anthropocentric considerations into a wider ecological structure. For example, in biocentric reasoning, human-oriented considerations sometimes were embedded in a wider ecological context of what has moral standing ("there's people, nature, and animals . . . you're killing one third of the environment that way [killing animals]. I don't think that's right.") Other times, anthropocentric considerations, such as rights, did not disappear but were extended to a larger ecological community ("because I think fish and animals have a right to live just like we do, and it's not fair to have killed them this way"). Yet, although biocentric reasoning increased with age, so did anthropocentric reasoning. In other words, it does not appear to be the case that, as children develop, biocentric reasoning simply subsumes anthropocentric reasoning. Rather, it appears that through development, unelaborated concerns for the well-being of nature give way to both human-oriented and nature-oriented considerations.

In comparison with earlier studies (Howe et al., 1996; Kahn & Friedman, 1995), a richer account of biocentric reasoning emerged from the analysis of the justification data. Some categories focused on valuing biological life and natural processes and on establishing value equivalences between human and nonhuman life forms. Other categories focused on various forms of biocentric justice reasoning, including those that established justice on the basis of direct relations between human and nonhumans and compensatory, conditional, and perspective-taking relations. Another particularly relevant category from a virtue perspective on moral development was that of teleos of nature. This reasoning involves an Aristotelian-like conception of the proper endpoint or functioning of the world. As one child said, "Yea, because it looks better . . . Well, I mean without any animals the world is like incomplete, it's like a paper that's not finished." In this example, as well, aesthetic reasoning ("it looks better") helps establish the biocentric teleos. Thus, it is possible that aesthetic sensibilities—which are anthropocentric insofar as they refer to the viewing or experiencing pleasure of human beings—help foster the development of biocentric reasoning (cf. Jarrett, 1991; Kellert, 1996, 1997).

There is a curious tension in thinking about the idea of human nature. Because we are biological beings with an evolutionary history, it would seem that all of human activity is "natural." Yet, as human artifacts (such as those amassed in cities) become increasingly extensive and complex, they often seem to drive a wedge between humans and the natural world. Philosophically, this tension has resulted in consistent difficulties in reconciling a conception of the human that is both a part of and apart from nature (Rolston, 1989).

The results speak to this issue. Children distinguished between harm wrought to marine life by human activity (an oil spill) and by other aspects of nature (other marine life). Almost half of children's justifications for this differentiation turned on biocentric considerations. As one child said, "Because it's natural for an older fish to eat a younger fish to survive, and oil is not natural. It's not natural to the fish." Here, nature is validated as the means for causing death, and, at the same time, certain effects of human activity do not count as natural. In addition, children responded with more biocentric reasoning to biological parts of nature (marine life) than to inanimate parts of nature (shoreline). More directly, children were asked what it means to live in harmony with nature and to provide examples. Results showed a developmental trend. Younger children more often conceived of living in harmony with nature in terms of a particular type of right action, whereas older children also incorporated conceptions of respect for nature and living in balance with nature. Interestingly, the "acting upon" harmony category in essence involved welfare considerations ("to help the animals and plants, not polluting the air"). In turn, the harmony categories "respect for nature" and "balance with nature" involved properties—such as respect, proportionality, and equality—which are traditionally ascribed to justice. Thus, the results begin to delineate ways in which children's conceptions of virtue are at times structured by welfare and justice considerations (cf. Killen, 1996).

As environmental problems increase, scientists across the disciplines have argued that greater knowledge is needed about the human relationship with nature (Kellert & Wilson, 1993). Developmental psychologists have an important role here. How do children's early affiliations with nature take shape and form conceptually, and how do seemingly sophisticated moral conceptions (centered on notions of rights, freedoms, justice, equality, and respect) become central to children's environmental moral reasoning? Such processes, for example, may depend on children first establishing human–human moral relationships and then applying the resulting concepts and values to the natural world. Alternatively, such processes may be more dialectical, wherein children's affiliations with the natural world help estab-

lish their human affiliations, and vice versa. Although such issues await further research, at least this much is clear: First, parents and educators alike can bring abundant moral discourse—of the kind shown here—into children's environmental education. Second, studying children's reasoning about nature provides a unique means by which to conduct basic research on children's moral development.

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