

Science and Ethics: Some Issues for Education

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ABSTRACT: Ethical issues concerning pain and suffering of animals are necessarily a consideration when it comes to killing “pest” or “feral” species in Australia. Within a continent where there are no large predators, many introduced animal species such as rabbits, foxes, horses, donkeys, camels, goats, and mice have been able to thrive, competing with the interests of farmers and graziers, and livestock and food production. These species, thus, gain the label of “pest.” Many methods now exist to kill these species and, consequently, ethical issues arise concerning the possible pain and suffering caused as a direct result of these methods. Yet within government and scientific communities, ethical issues are reduced to a secondary consideration without serious debate or contention. Ethical issues appear to be at odds with scientific agendas. How can environmental ethics be incorporated as part of science-based decision making that appeals to objectivity and scientific evidence? Within educational institutions as well, the same dilemma exists: How can ethical issues be addressed within the science curriculum and in the classroom? A greater understanding of various perspectives on the subject of environmental ethics and the value positions advocated by proponents of these perspectives may help teachers consider ways of handling such issues in the science classroom. © 2001 John Wiley & Sons, Inc. *Sci Ed* **85**:769–780, 2001.

[There are] two sorts of uses for the knowledge coming from ecology; for management by giving us power over nature, and for protection by giving us power over ourselves via an appreciation and respect for nature. Such realisations of value arrive with facts about nature. It is now time that insights from environmental ethics be included as appropriate in scientific environmental studies, especially where these can guide us in choosing the scales of impacts to be detected and their acceptability, the types of ecosystem recovery to strive for in restoration ecology, and the more urgent imperatives within conservation biology. In

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this way, the two-way interaction between ecology and ethics will continue to bear fruit for both disciplines.

(Fairweather, 1993, p. 17).

PREAMBLE

This paper considers the relationship between some of the assumptions associated with traditional scientific perspectives (such as those expressed in notions like ecology) and those associated with the ethical issues that tend to arise in animal management practices, and raises some related educational questions. In considering this relationship, the paper draws on a 3-year research project that explored the activities of rural communities in dealing with problems associated with the presence of feral animals in their local environments.

More specifically, the main focus of this project was on a Victorian Landcare group's efforts to improve their management of feral rabbit populations in their particular rural setting and to educate the broader community about effective rabbit management practices developed by the Landcare group. A relevant factor is that the activities of the rural community and the research project itself were funded by a national scientific agency (then the Bureau of Resource Sciences—now Bureau of Rural Sciences). A consequence of the influence of the funding agency and the nature of the issues arising in attempts to manage feral animals was an intersection of two distinct sets of values: those associated with traditional scientific perspectives and practices; and those associated with the resolution of environmental ethical questions. This paper considers some of the implications for science teaching of the resonance between scientific and ethical perspectives.

In terms of structure, the paper will begin with a clarification of key terms and a sketching of the position of some key thinkers in the field of environmental ethics with a view to developing a perspective on issues in this field. The paper will then apply an environmental ethics perspective on the particular case of feral animal management in Australia, addressing issues that arose in the actual practice of a Landcare group involved in rabbit management. Finally, the paper will consider some implications of environmental ethics issues for science education, outlining possible ways of handling such issues in science classrooms.

PERSPECTIVES ON THE FIELD OF ENVIRONMENTAL ETHICS

When you come to mammals, or indeed to any vertebrate animal, it's pretty clear that they do feel pain, and many of them do feel pain in ways similar to us. So the justification for using an animal has to be extremely strong. I often ask scientists when they say that it's all right to use an animal, would you be prepared to use a human being at a similar kind of mental level? Would you be prepared to use, for instance, a very severely retarded human being that showed no more awareness than a dog? And of course we don't, and shouldn't, use humans of that sort in the kind of experimentation scientists do. So if we are prepared to use dogs that are just as aware, just as sensitive, just as capable of feeling pain, how can we defend that? It's just saying—they're not a member of my species, so it's okay to do something to them that I wouldn't do to a member of my species. And I think that's very like what people used to do about other races. They would say, well that black person's not a member of my species so it's okay to do something to him, capture him, say, make him a slave, whatever, that I wouldn't have done to someone who is a member of my race. And I don't think there's any justification for either of those attitudes. (Singer from an interview with Williams, 1991, p. 142)

In this article we are taking environmental ethics to be about value or moral judgements to do with the ethical responsibility of humans towards the natural environment or aspects of the natural environment. Inevitably, then, the field is extensive and contested, and will

be represented here through a consideration of one particular ethical issue, that of animal welfare. Even within the area of animal welfare there exists an extensive discourse of which only a partial portrayal can possibly be represented here. This section of our paper draws upon the experiences of a Landcare group active in rabbit management, government literature, and literature in the field of environmental ethics. With these sources as a base we argue that there exists a disparity between a scientific government agency's aspirations to resolve pest management issues through the accumulation of measurable data, as exemplified by the process of cost-benefit analysis, and philosophical issues such as ethical considerations. Ethical considerations, according to the government agency's policy, are deemed to be a part of "best practice," yet in *practice* and in *research* these considerations are at best marginalized and, in the main, ignored. The educational ramifications of this marginalization are also significant and are discussed in the final section of this paper.

There are a number of doctrines to do with animal welfare, each valuing animals in relation to humans (and human activity) in different ways. An example of a particular stance in relation to animal welfare is "animal liberation," and a distinguished proponent of this perspective is Peter Singer. The introductory quote heading this section is from an interview by Robyn Williams with Singer, which exemplifies Singer's compelling argument on animal ethics. Singer adheres to a "fundamental principle of equality," that is "the principle of equal consideration of interests," not just for humans, but for all sentient beings (Singer, 1993, p. 329). The basis of Singer's belief is that pain and suffering are essentially "bad" and should be precluded or minimized regardless of "the race, sex, or species of the being that suffers" (Singer, 1995, p. 17).

Singer's conception is often referred to as "utilitarianism" (Bilimoria, 1992, p. 17; Pojman, 1994, p. 25), which is based on the perspective of Jeremy Bentham. Bentham believed that beings are morally respectable on the grounds of sentience, not reason, and that all sentient animals have the capacity to suffer. According to Bentham, if an animal has the ability to feel pain and pleasure then it follows that it has interests, and the frustration of these interests leads to suffering. What is advocated is a maximizing of satisfaction of interests regardless of whether they be the interests of humans or the interests of other sentient animals (Pojman, 1994, p. 25)—both are afforded equal consideration.

Thus Singer and other animal liberationists empathize with animals through the shared capacity of humans and other animals to feel pain and suffering. They attempt to provide an equitable, nonanthropocentric basis for an animal ethic that is not "species-ist" (Bilimoria, 1992, p. 17). This empathy has been criticized by many scientists who claim it anthropomorphizes animals. In defence of this stance, the animal liberationists Russell and Pope (1993, p. 37) present the following correlation:

Many other animals have all the essential physiological structures to think and feel in ways similar to our own. Furthermore, scientists assume this to be true in laboratories all over the world. There are animal "models" for a multitude of human states and diseases, whether of the body or mind. Even the lowly and much despised rat has been used to model complex psychological problems like depression and learned helplessness.

Recognition of equity as both a rational moral principle and a basis for relations between humans, as well as a basis for relations with those outside our own species (Singer, 1993, p. 329), creates a conflict for communities and governments involved in deciding the fate of Australia's "introduced pest" animal species. How can we consider poisoning rabbits, for instance, when we contend that they deserve the same equitable consideration as humans?

Singer's response to this dilemma considers the social (and cultural) constructedness of the term "pest," as well as acknowledging a clash of interests between our need to provide food for human consumption and the threat that other beings, such as rabbits and mice, pose

to the supply of this food through their need to feed and sustain themselves:

The farmer will seek to kill off the “pests” by the cheapest method available. This is likely to be poison. The animals will eat poisoned baits, and die a slow, painful death. No consideration at all is given to the interests of the “pests”—the very word “pest” seems to exclude any concern for the animals themselves. But the classification “pest” is our own, and a rabbit that is a pest is as capable of suffering, and as deserving of consideration, as a white rabbit who is a beloved companion animal. The problem is how to defend our own essential food supplies while respecting the interests of these animals to the greatest extent possible. (Singer, 1995, p. 233)

Singer does not argue that no killing should take place, particularly when he considers current acceptance of such actions where human interests conflict with the interests of other animals. As Russell and Pope explain:

No animal’s interests are served by its being killed. Therefore we should only kill animals if we have some reason which we think overrides the animal’s interest in staying alive. If an animal is badly injured, and will not recover then its interests are not served by staying alive so the best thing to do is to kill it. Being killed painfully isn’t in an animal’s interest, so it is best to kill it painlessly. Naturally, your own interests are worth considering, so it might be quite reasonable to let an injured Komodo dragon die rather than risk your own life trying to kill it.

. . . killing an animal when the alternative is starvation is quite reasonable . . . To eat animals for food when one lives in a city with a massive choice of alternative foods is wrong . . .

. . . self defence is always a reasonable defence for killing an animal, or a person, for that matter. Of course one usually needs to establish that there was no reasonable alternative to killing before judging the action acceptable. (Russell & Pope, 1993, p. 38)

Utilitarian theory supports the consideration of the interests of animals yet does not necessarily advocate an outcome that is favorable to those interests, as demonstrated by some of the circumstances described above. What Singer hopes for is deliberation about, and development of, more humane methods of killing in circumstances where there is a perceived need to limit the number of animals when the interests of those animals are overtly incompatible with our own (Singer, 1995, p. 234). His view challenges anthropocentric ethical arguments.

Another ethical position to do with the treatment of animals is referred to as a “deontological” ethic (Pojman, 1994, p. 25), which, like utilitarianism, maintains that humans and other sentient animals all possess the same fundamental psychological idiosyncrasies (such as feelings, perceptions, memory, intelligence, etc.). Acknowledgment of these inherent qualities means that all sentient beings have intrinsic value¹ with no one species considered superior to any other. In this sense, “intrinsic value,” refers to the “value of an object that is independent of the presence of a valuer” (Armstrong & Botzler, 1993, p. 53). A deontological ethic, however, distinguishes between the moral obligation of adult humans and the inability of other sentient animals (including some humans) to conceive of moral obligations. A significant proponent of this view is Tom Regan.

¹ Regan uses the term “inherent value” rather than “intrinsic value,” but the sense in which he applies this term corresponds with the meaning described above for “intrinsic value”. Armstrong and Botzler apply the term “inherent value” to mean “value which requires the presence of a valuer who can appreciate the object or experience” (1993, p. 53). This distinction between “intrinsic value” and “inherent value” has relevance in theory but practically it is not feasible because a “value” cannot exist independently of the valuer.

Regan's argument is founded on a conception that "individuals are subjects-of-a-life" (Regan, 1993, p. 321). By this he means that individuals within species have

. . . beliefs and desires; perception, memory, and a sense of the future, including their own future; an emotional life together with feelings of pleasure and pain; preference- and welfare-interests; the ability to initiate action in pursuit of their desires and goals; a psychophysical identity over time; and an individual welfare in the sense that their experiential life fares well or ill for them, logically independently of their utility for others and logically independently of their being the object of anyone else's interests.

A distinction Regan applies is that between "moral agents" and "moral patients." Moral patients (for example, most mammals other than the majority of human adults, human infants, people who are considered to be senile . . .) cannot be held accountable on moral grounds because they cannot conceive or carry out actions based on moral principle. Moral agents, on the other hand, can be held accountable on moral grounds for the actions they choose. Most adult humans would fall into this category. Despite this distinction, Regan attributes equal status to both agents and patients on the grounds that they are entitled as individuals to respectful treatment (Regan, 1993, pp. 321–322) because they all have inherent value. This view is founded, to some extent, on Kant's (Wolff, 1967) argument that a person has rights because they are rational beings, capable of acting autonomously and capable of formulating conceptions of the "good" and possessing "ends of their own" (VanDe Veer & Pierce, 1986, p. 11). Other things (other animals included) are incapable of doing this and therefore do not have rights, but we have a duty to these things and, in the case of animals, we should consider them kindly and with care. The duty, then, to other sentient animals is only indirect in that they help us consider our relationship with other human beings (see VanDe Veer & Pierce, 1986, pp. 11–12). Kant's view, however, unlike Regan's, is essentially anthropocentric.

Some similarities exist between Singer's and Regan's views, particularly their adherence to the principle that sentient animals have moral value (Armstrong & Botzler, 1993, p. 318), but fundamental differences remain between these two perspectives. Where utilitarianism views the morally right act as one that *maximizes utility*, aiming to procure the best overall outcome, deontological ethics maintain that particular features in the moral act *itself* have intrinsic value, regardless of the overall outcome (see Pojman, 1994, p. 26). Both Singer and Regan do, however, advocate critical consideration of an animal ethic or, as Jickling (1996, p. 159) proposes in considering Singer's interest, they wish to develop "disinterested and rationally defensible moral theory" in relation to contemporary issues. In so doing they do not want to impose an ethical or moral code but, rather, respect a "process for carefully considering what might constitute a "good" state of affairs or better practice."

ENVIRONMENTAL ETHICS: A FERAL ANIMAL CASE

In applying Regan's deontological stance to the feral animal issue in Australia, the "pest" status assigned to a particular animal does not reduce its right to respectful treatment. Even native species deemed to be "endangered" are treated with no greater respect (Regan, 1993, p. 326):

What is recognized is the prima facie right of individuals not to be harmed, and thus the prima facie right of individuals not to be killed. That an individual animal is among the last remaining members of a species confers no further right on that animal, and its right not to be harmed must be weighed equitably with the rights of any others who have this right.

Regan believes that it is “human wrongs that need managing” (Regan, 1993, p. 324) rather than animals requiring control and management by humans. Included among what are deemed “human wrongs” are the ownership of farm animals and the clearing of natural habitat for commercial gain, such as for farming and grazing. The deontological position would seem to defend the rights of animals such as mice and rabbits and therefore impose a “no kill” position. The “introduced species” label attributed to rabbits and mice in Australia is not significant to this argument, as it has no bearing on the individual’s right to respectful treatment. Introduced species attract no more or less respect than native species, or even an endangered native species. Thus, all species and all individuals within a species, regardless of the human conception of the worth of that species, have equal right not to be harmed.

Distinct from Singer and Regan, who both base their perspective on the principle of equity for all sentient beings (Armstrong & Botzler, 1993, p. 319), is a perspective which is essentially anthropocentric and conceived on the grounds that ethical principles apply to humans exclusively. The basis for this stance can be found in the writings of Aristotle and in Judeo-Christian beliefs.²

Human needs and interests are considered to be of greater value and importance than those of nonhuman entities (Armstrong & Botzler, 1993, p. 275). According to them

In contemporary Western society, anthropocentrism often serves as a “default ethic,” a position assumed without careful consideration of alternative world views. However, anthropocentrism also is a position held by many thoughtful and reflective people as the most morally correct perspective to advocate.

A “default ethic” appears in scientific agencies’ policies in pest management, where human needs and interests in relation to agricultural production tend to be placed above the interests and needs of species deemed to be “pests.” For example, publications dedicated to rabbits, foxes, horses, and goats place more value on environmental, economic, and agricultural concerns than on concern for the pain and suffering of particular animal species. Poisons such as 1080 are advocated for fox and rabbit control. It is acknowledged by some people that 1080 is likely to cause some pain and suffering but this concern is put aside for perceived greater human interests and needs (Lobban, 1996, p. 36):

Much will be said about the cruelty and suffering caused by the use of 1080. In an ideal world there are many things we would change, the fact is we have to be realists, not idealists. In all instances, the use of 1080 poison is an essential part of effective rabbit, fox and wild dog control programs. It is critical that these conventional methods continue to protect the future survival of much of our wildlife, the quality of the environment and long term viability of agriculture. The ethical cost of not using 1080 is to allow pest numbers to

² Aristotle proposed that those with less rationality exist to serve those with more rationality. Like Aristotle, Thomas Aquinas believed that to kill and use animals to serve the purposes of humans was part of the natural order. Aquinas believed that we should not inflict undue cruelty onto animals as this may indirectly allow humans to inflict cruelty on their fellow humans (this is sometimes referred to as a virtue ethic), but he did believe that animals have no independent moral standing or intrinsic goodness (VanDe Veer & Pierce 1986, p. 10). In making his case, Aquinas refers to the writings of St Paul who, according to John Young (1991, p. 56), represents an amalgamation of Hebrew thought with that of the Greek Stoics. Stoicism (perceives that human’s subdue nature through creation and design) arose from the demise of the Greek empire. The Biblical notion of human domination over the earth (see Genesis 1, 26–30 for example) has been debated as meaning that this domination permits humans to act as they will towards animals and other objects, or that this domination means that we have been given a responsibility of stewardship for all other things. However, the Judeo-Christian concept rests on a belief that humans are superior to other animals and plants because God has given humans this higher status within a hierarchy (with God at the top and humans made in the image of God).

build up, causing widespread destruction to native flora and fauna and significant losses to agricultural production, thus undermining the viability of many rural communities. Until such time as economically viable alternatives are available to the rural community, the use of 1080 must continue for a range of sound economic, social and environmental reasons.

The ethic adhered to, and endorsed through legislative processes for feral animal control, does not reflect careful consideration of alternative world views but, rather, appears to respond to availability and lethality, as suggested by Glenys Oogjes (ANZFAS), instead of adherence to ethical considerations resulting from public debate. Clive Marks, of the Victorian Vertebrate Pest Research Unit, concurs with this view (Marks, 1996, p. 50):

Selection of fumigants has often been made on the basis of lethality to the pest, availability and cost effectiveness; while humaneness was a secondary consideration . . . It is likely that the perception of the animal as a pest greatly influenced the benevolence which humans were prepared to extend to it!

Managing Vertebrate Pests: Principles and Strategies (Braysher, 1993) states that this publication provides “best possible, humane, scientifically based guidelines for pest management.”³ The question we raise here is whether “best practice” can ever be determined through considerations conducted within a scientific conceptual framework—that is, when there exists no consideration of broader ethical debates concerning feral animal control within social settings. A related question is, “In what way can a consideration of environmental ethics be educative?”

Ethical issues associated with rabbit control do not seem to be an important part of decision making about which way to kill rabbits. In the research conducted in developing a case study of a Victorian Landcare group, ethical discussions about the pain and suffering of particular “pest” species, the construction of “pest,” and ethical decisions about killing rabbits were absent. Moreover, it seems that there is a tacit or “default” ethical position, one which mirrors community sentiment, that because rabbits are “pests” there is a lesser obligation to regard their pain and suffering. An anthropocentric ethic prevails, with environmental, agricultural, and economic considerations overriding the value of rabbit; hence, the availability and acceptance of various control methods for animals conceived of as pests. It also appears that different “pest” species are treated differently, perhaps because of their size. For example, pain and suffering in relation to mice deemed to be “pests” appear to be of little significance in discussion or recognizable through practice, while with rabbits this was not necessarily the case.

Although farmers and other participants involved in a Victorian rabbit project did not discuss ethical issues in various fora, such as the Landcare group’s rabbit committee meetings and other Landcare meetings, their actions in the field demonstrated that they did consider the pain and suffering of this animal labelled “pest.” One farmer, during an informal conversation while watching the fumigating of rabbit warrens, stated that death by fumigation was probably the most painful way for a rabbit to die. Another farmer working in the field responded quickly to break the neck of a rabbit that was obviously in some distress as it struggled within the jaws of his dog. Mice, however, present a different case. Several farmers openly admitted to using various brews for the destruction of mice without knowing what chemicals actually constituted the concoction. More attention tended to be paid to the pain and suffering of non target species than the pain and suffering of mice. These instances, to some extent, reflect socially accepted practices within these particular communities, at the very least, and arguably reflect accepted practices of many Australian

³ This statement appears on the back cover of the publication.

agricultural communities. They also exemplify an unwritten ethical code in that responses to the pain and suffering of different animal species appear to reflect broader socially accepted practices. For example, it is accepted that rabbits can be killed by fumigating their warrens but the same practice would not be tolerated if applied to a burrowing indigenous animal. For instance, it is our experience that in Australia many people would find it objectionable to even consider throwing poison down the opening of a wombat hole and close the burrow opening but many people would find it entirely acceptable to do the same to a rabbit.

The utilitarian, deontological, and anthropological descriptions presented here are merely glimpses of the extensive field of environmental ethics; to offer a more comprehensive account of the field would be a task well beyond the ambit of this paper. Nevertheless, it is clear that feral animal issues and feral animal management necessarily involve ethical considerations and, considering the various views represented here, ethics concerning feral animals are fundamentally contested. Consideration of this contested discourse to any depth is not entered into by dominant government discourses.

The relatively low status ascribed to ethical considerations vis-a-vis economic and technical considerations is reflected, and is possibly a factor, in the lesser emphasis on ethical considerations in the field. Economic considerations are an inviolate requirement in government research agencies; monetary cost-benefit analyses figure very high among accountability claims. The domination of scientific knowledge has managed to not only shape the way that ethical issues are considered but, along with technocratic processes, has also determined its marginalization. Support for this can be found in a study carried out in Canada by Vincent (1994, p. 310),⁴ who claims that:

. . . while many people acknowledge the importance of ethical questions while pursuing “progress” or economic growth, they are as yet uncomfortable with the term “environmental ethics,” and unsure about its application to real issues.

Too often, wildlife management decisions are defended by appealing to objectivity, statistics, and hard scientific evidence. Science is not value neutral; however, values of scientists and values of society are frequently not discussed.

Furthermore, as Eugene Hargrove explains (Hargrove, 1994, p. 44), decision makers tend to possess qualifications in science-based fields and thus are comfortable dealing with science rather than ethics:

Most environmental professionals are trained in ecosystem science in preparation for their environmental work, and most try to keep up with new research as it becomes available. In contrast, they receive little or no training in ethics and values, and, as a result, are ill-prepared to understand or apply research in environmental ethics in their work.

EDUCATION, SCIENCE, AND ETHICS

This brings us to the educational question of how to approach the treatment of environmental issues like feral animal management in the classroom. Not surprisingly, policy statements in science education are somewhat weak in their level of advice on how to reconcile science and values in science education. One of the reasons for this might be that

⁴ Jane Vincent of the Yukon College conducted a survey in Canada investigating views about environmental ethics. The survey was conducted in July and August 1993. Survey respondents included federal, provincial and territorial representatives working in the wildlife management field, people involved with education, and representatives from non-profit organisations (see Vincent 1994, p. 324).

conventional views of science are objectivist in nature, equating methodological rigor with the eradication of individual human and collective social values. Such views suggest that science as a process is distinctive in that it can make special claims about objectivity, rationality, and truth. They suggest that its *modus operandi* of systematic, widespread attempts at falsification of proffered truth claims within an “open society” of researchers committed to these three ideals is capable of marginalizing the influence of subjective qualities. To the extent that this conventional Popperian notion of science exists and is reproduced in science education classrooms and laboratories, its disinterest may well lead to a lack of interest in or acknowledgment of the nature and importance of values in scientific decision making. Put another way, science education seems more inclined, perhaps due to a methodological inheritance from its “parent” discipline of science itself, to focus on the scientific facts, concepts, and theories associated with a particular animal management issue, rather than broadening its perspective to include the human values embedded in the historical, social, cultural, and political context of the issue. This comment applies much less to alternative approaches to science education like “Science-Technology-Society” (see for example Bybee, 1987) and “environmental education” (Robottom, 2000).

However, some specific guidance for dealing in the classroom with issues such as that concerning feral animals can be gained from the Australian National Statement on Studies of Society and Environment (Curriculum Corporation, 1994). This national statement takes a clear stance on the role that values can play in the curriculum:

First, they are an object of study. When students consider people and their actions within societies and environments, they investigate and analyse the values and beliefs that influence them. As social and environmental participants themselves, students learn to subject their own values and actions to careful scrutiny . . .

Second, values influence what is selected for study. No curriculum is value-free or value-neutral and so, because of the diversity and changing nature of values held by Australians, it is important to identify areas of agreement on what values should influence studies in this learning area . . .

Third, certain values are a result of study. Through their studies of society and environment, students come to value diversity in viewpoints, curiosity in questioning, thorough and balanced investigations, logically developed and well corroborated argument and justification . . .

A statement such as this suggests three ways in which teachers and students can educatively engage issues such as the feral animal case described earlier. First, science education can broaden its perspective to consider the elements of the issue that formerly (in conventional science education) might have escaped scrutiny as a result of a methodological predilection for focusing on the “objective facts” of the issue. For example, in addition to addressing such undeniably important empirical considerations as population size, effect on indigenous flora and fauna, and “kill rates” of certain rabbit management techniques, students could be invited to debate the ethical considerations of rabbit management, including the relative levels of pain and suffering associated with different management techniques. These latter considerations are philosophical rather than empirical in nature.

But in addition, the National Statement on Studies of Society and Environment points out that the ways in which an issue like feral animal management is handled in educational settings is itself a function of human values—those of the teacher and the school, for example. These values will be expressed in the way the resource material is selected and sequenced, what newspaper articles are chosen for student perusal, and the declared or

undeclared position of the teacher on the issue. Another way of putting this is to say that education itself is not neutral, but a value-laden, political act. This perspective may not rest easily with people (scientists, teachers of science, students of science, etc.) whose perspective on the relationship of science education and values might be influenced by their (objectivist) perspective on the relationship between the parent discipline (science) and values. The National Statement also points out that it is important to recognize that the relationship between education and values is a two-way one—that education has a strong capacity to influence the values that students hold in respect of an issue, or bring to bear in their explorations of an issue.

So, in short, we are suggesting that a “meeting of the discourses” might benefit science education in its orientation towards issues like feral animal management—issues that constitute an interplay of scientific and ethical considerations. The “objectivist” orientation of science education discourse serves it well in supporting the careful, systematic examination of the empirical elements of the issue. On the other hand, the “subjectivist/philosophical” orientation of the Australian curriculum documentation for the Studies of Society and Environment supports a recognition and examination of important nonempirical (ethical) considerations that are central to the meaning and significance of issues such as rabbit management.

One of the difficulties facing educators is that the resource material available on environmental ethics topics like feral animal management are themselves a function of the work environment that produces them. Work environments such as government research agencies, including those that produce educational support material for schools, tend to be dominated by decision making processes that reflect the aspirations of science processes such as generalisability and value neutrality (Robottom & Andrew, 1996). Such aspirations work against the inclusion of diverse views and value-laden debate about issues such as ethical issues. Perhaps this is why governments tend to prefer, and defer to, environmental ethics packaged as a “code” (Andrew, Jickling & Robottom, 1996) to determine “appropriate” actions rather than, as Jane Vincent explains, “as an intellectual process for investigating and evaluating ideas about values” (Vincent, 1994, p. 311).

In terms of decision making, Vincent sees that beyond “ethics as code,” ethics as an intellectual process is “for questioning assumptions, examining arguments, weighing competing claims, and making judgements in order to come to a decision” (Vincent, 1994, p. 313). Clearly the educative possibility of this application of environmental ethics enables individuals to question rather than accept current practices, to examine current, contestable value positions, and to think critically about accepted practices and social norms.⁵

In November 1993 Vincent’s “intellectual process” was put into practice when a forum on Northern Protected Areas and Wilderness was held in Whitehorse, Yukon, Canada, and various contested ethical positions were discussed and debated. The proceedings of this forum included a listing of “recommendations” (Jickling, 1994, pp. 23–24) concerning environmental ethics. The following selected recommendations from this list are consistent with the argument presented here for consideration of ethical issues:

- Encourage professionals to recognize the existence of disparate views, seek to understand them, and engage in reasoned discussion about them.
- Recognize, state and justify the ethical assumptions which underlie scientific research and management decisions; the value positions of individuals and groups making decisions should be openly recorded and discussed.
- Encourage the process of “ethical thinking” . . .

⁵ The distinction “ethics as code” and “ethics as process” has been made by Jickling (see Jickling, 1996).

- Encourage the use of language which reflects a true range of social values in discussion, policy formation, and reporting . . .
- Encourage education at all levels to enable people to think about values, the nature of competing claims, and to evaluate the relative merits of these claims.

It would be wrong, however, to consider these points with an aim of attempting to reach some form of consensus in classroom considerations of environmental ethical issues. When “common ground” becomes the focus of decision making where disparate opinions exist, then it is usually found in areas that are of little significance, and difficult issues and contentious areas of interest are thus left unchallenged. All issues are essentially contested (otherwise they would not be considered to be “issues”). What is required is a debate that focuses on revealing and examining different viewpoints rather than aiming for general agreement. A final decision needs to be made, but what is advocated here is decision making based on broad debate, considering perspectives beyond the dominant anthropocentric view. If contestation is avoided then divergent views about environmental issues will also be avoided, and the debate will be narrowed to one that no longer reflects the nature of the issue. Simulation games, which emphasize the contestation of debates and processes of decision-making while enabling a (simulated) decision to be reached, may have a role in science education informed by these perspectives.

Contemporary practices, as exemplified by the Landcare group’s rabbit control program activities, and contemporary policy, as exemplified by the Australian government publication *Managing Vertebrate Pests: Principles and Strategies* (Braysher, 1993), demonstrate that an exploration of ethical issues and views is omitted from what is supposedly considered to be “best practice.” In our view, to be educative, “best practice” in science education must be inclusive of philosophical forms of inquiry that represent and explore important ethical issues.

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