Introducing Ethics into the Natural Resources Engineering Curricula

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Ethics is the discipline concerned with the process for deciding what is "good behavior" and what is "bad behavior" in particular situations. In other words, what is one's moral obligation in particular instances? How do our values map into behavior in specific situations? Ethics provide written or spoken standards. The goal is not to define a "one size fits all" ethical position. Such does not exist. Each person needs to be able to raise a conscientious defense for positions taken when ethical questions are involved.

We hear constant reference to values and ethics, particularly when reading literature on Total Quality Management (TQM). Here we are mainly concerned with conservation values and ethics versus resource development values and ethics. Engineers have an interest in and can offer solutions toward both points of view. ABET and state licensing boards are becoming increasingly interested in ethics and associated assessment issues.

An ethics introduction is presented to stimulate understanding and compassion for widely diverse views. This introduction forms the core of a reading planned for students engaging in an ethics discussion lab. A case study involving the tension between conservation and development with a discussion guide is also presented with the goal of raising the consciousness of students of diverse ethical positions. The exercise would most likely work best with junior-senior level students of diverse backgrounds in small group settings.

I. Review of values and ethics[1]

[1] This section was developed with the aid of Dr. Alireza Esteghlalian, Post Doctoral Associate, Biol.& Agr. Engr. Dept., Driftmier Engr. Center, University of Georgia, Athens, GA 30602.

Conserving natural resources is considered necessary by most people. Exploitation of resources for short-term economic gain can also be necessary. The conflict between conservation and exploitation creates ethical dilemmas leading to an examination of individual and societal values.

This appendix briefly surveys selected topics that are not typically part of engineering curricula. Ethics, ecological design, resource economics issues, and criteria for a quality project are presented to stimulate understanding and compassion for widely diverse views. A case study involving the tension between conservation and development is also presented.

The goal is not to define a "one size fits all" ethical position. Each person needs to be able to raise a conscientious defense for positions taken when ethical questions are involved. We hear constant reference to values and ethics, particularly when reading literature on Total Quality Management (TQM). In this literature, which the author embraces, distinctions are made between values and ethics as Table A.1 shows.

Table 1. Correspondences between ethics, values and morals.

Ethics	Values - ethical positions claimed by individuals or organizations	Morales - the "fruits" of ethics and values
Articulated statements, spoken or written, defining the standards for right and wrong behavior; the discipline of study of right and wrong.	Define the individual	Translate values into actions
	Are constant	Are changing
	Are internally derived	Are situationally determined
	Are concerned with virtue	Are concerned with justice
	Are general	Are highly specific
	Are stated morally	Are stated behaviorally
	Are judged as good or bad	Are judged as present or absent
	Set priorities	Set limits for appropriate behavior
Source: adapted from Stamatis, 1996.		

Morals are what others observe; values, like motives, are invisible until mapped into a tangible form by one's observed morals. Ethics provide written or spoken standards.

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specific situations? Here we are concerned with conservation values and ethics versus resource development values and ethics. Engineers have an interest in and can offer solutions toward both points of view.

Philosophers have proposed many theories concerning what a morally "good" action means. Geisler (1989) summarized historical approaches to this question, shown in Table A.2. Approach number 1 says that one who controls the most land, labor, capital and / or technology is in the "drivers" seat. Technology is a recent addition to the land, labor and capital list.

Approach number 2 has been the subject of a vigorous debate concerning the civil rights movement and the modern "political correctness" movement. Government has gone nearly all the way to "political correctness." The tendency of police to charge alleged offenders from poverty stricken neighborhoods but not to file charges for similar offenses committed in affluent neighborhoods illustrates possible racial tensions arising from number 2. Some have attributed racial motives when observing the tendency to site a potential polluting animal production operation in a poor county versus an affluent county. Some have coined the term "environmental racism," responding to these situations. Ethics are subjective according to the number 2 ethical position. Ethical subjectivism enables an open mind but fails to provide an adequate objective standard of behavior.

Approach number 3 in modern discussion represents the tension between the rugged individualist versus the collectivist. As society continues to integrate, individuals increasingly call upon the courts to define constitutional rights in the face of increasing pressure to act collectively. A modern outgrowth of number 3 is the belief of the positivist school that the act of asserting makes the assertion true. The statement "If it is in print it is true; if it is in print on glossy paper it is definitely true" is a belief held by many which may relate to the number 3 ethical position. Ethical subjectivism stems from position number 3. In simple terms, ethical subjectivism states that man is infallible. Anyone may say any thing about any subject if it is thought that one may influence another by doing so according to ethical subjectivism. This idea is deficient because it fails to consider reason.

Approaches 4a and 4b come to us in modern form via the animal rights movement. Number 4a by itself has largely been discarded. Number 4b is a basic value of many in the environmental movement. Leopold (1949) wrote, "A thing is right when preserves the integrity, stability and beauty of the biotic community. It is wrong otherwise." This position is the ethical basis for many environmental writers. During the past 50 years, it has been a major challenge to philosophers, sociologists, theologians, ethicist, ecologists and many others to define and justify the place of a human being within his natural environment (Nash, 1989; List, 1993). The results are confusing and often contradictory as we would expect from the variety of ethical positions available. Views range from anti-industrial ideas such as advocated by *Deep Ecology* and *radical environmentalism* (Orr, 1994) to pro- industrial philosophy of

objectivism (Rand, 1971). The anti-industrial approach takes the view the human being is an insignificant member of the biotic community. It grants him no right to interfere with the natural ecological processes for his benefit. Pro industrial approaches consider the human being as the master of nature. They allow the right to explore, exploit and alter the nature for his betterment. In the middle of this wide spectrum, many other bio- or anthropocentric philosophies exist. They narrow the human role to varying degrees of natural stewardship (Orr, 1994; Leopold, 1966). Ecology can become the " tail that wags the dog" when taken to extremes. On the other hand, a tragedy occurs when a species goes extinct which could contain the unique chemistry for saving a human's life. Responding to the issue of preserving biodiversity and conserving natural resources, Ethicists are presently debating an ethical standing for plants and/or animals. Historical ethical theories have not addressed the standing of plants and animals compared with people. The usual approach for structuring the debate is to consider past issues and how philosophers handled them. There is much similarity in positions 3, 4a and 4b in that they are inherently subjective.

Moderation, expressed in approach number 5 of Table A.2 is usually appropriate in resource development questions. The "end justifies the means" (number 8), basing questions solely on our pleasure (number 6) and basing good only on pleasure or beauty (number 9) can lead to significant difficulties. This is because one person's pleasure is another person's pain. The fundamental canons of the National Society of Professional Engineers (NSPE) are most recognizable as virtue ethics. They are given as follows:

* Hold paramount the safety, health and welfare of the public.
*Perform services only in areas of competance.
*Issue public statements only in an objective and truthful manner.
*Act for each employer or client as faithful agents or trustees.
*Avoid deceptive acts.
*Conduct themsleves honorably, responsibly, ethically and lawfully so as to enhance the honor, reputation and usefulness of the profession.

The fundamental canons are followed by rules of practice and stated professional obligations. The fact that these categories are needed speaks to the difficulties with virtue ethics.

Approach 6 is the classical pleasure based ethical system. "If it feels good, do it" typifies this approach. The time horizon is generally immediate instead of long term. The correct definition of pleasure is the difficulty issue for this approach. Pleasure based ethical systems sometimes form the basis for compromise, rightly or wrongly.

In a democratic society, utilitarianism (number 7) seems to take precedence among items 1 through 9, perhaps because it defers the fundamental issue of what is "good." Utilitarianism approaches form the basis of modern public administration. The following may represent number 7 in modern vernacular: *1) the consensus within a*

diverse public is to be built around the best possible scientific understanding of the issue; and, 2) the solution must be economically viable in the short and long term. Numbers 1-4 (especially number 4b) become foci for vigorous debate while trying to fulfil the utilitarian objective. Ethicists have criticized utilitarianism, claiming it is indifferent to individuals as it distributes economic satisfactions (e.g., pleasures and happiness) in society. What is the basis for pleasure? Is that all there is? Ethicists have also criticized it for not embodying an adequate description of human economic behavior. Utilitarianism has been called modern hedonism. In spite of these criticisms, society has largely accepted modernized utilitarianism as the primary society-based ethic in public administration (Perman et al., 1996).

Rule-based ethics (Number 8) are used extensively by the legal profession. Immanuel Kant articulated the rule of law for the sake of law. This idea lies at the heart of the concept of accountable standards. Rule based ethics lie at the heart of modern bureaucratic organizations and government. The scientific management approaches of Frederick Taylor and management thinkers had a high rule orientation.

"Spirit" or consciousness-based ethics (number 9) are applicable when seeking to understand and act on intents arising from the general will of society. The reappearance of democracy in the 18th century was in large part stimulated by contributions of Rousseau related to the formation of the social contract between a government and the governed. The social contract of Rousseau was predicated on the governed waiving certain rights to take advantage of protections offered by government. On the organization level, mankind agree to certain policies of organizations in order to receive certain benefits. The social contract approach was put forward to counter natural behavior characterized by egoism. Legislative sessions, and team meetings are in a sense a continuing negotiation of general or specific social contracts. Radical libertarianism, or the total disdain of all government, is the opposite of spirit-based ethics (e.g., flashback to Number 3).

Personalistic ethics (number 10) is in a sense, not concerned so much as what is legal or according to community standards, but with what is right. This ethic is based heavily on virtues and borrows heavily from Aristotle and other teachers. Noteworthy reformers (e.g., Gandhi, Martin Luther, M.L. King) appealed to this ethic. Current approaches to transforming leadership as opposed to transactional leadership appeal to personalistic. In applying personalistic ethics, one must insure that base motives do not enter unawares into the discussion. Rachels (1999) describes two terms relating to self interest, psycho egoism and ethical egoism. Psycho egoism essentially says that each individual knows best for himself. Mankind is ultimately selfish (Rand, 1971). This idea ultimately extended leads to the infallibility of selfish mankind. Motives for many behaviors can easily be reinterpreted to fit this ethic. It can also become irrefutable in that it blocks all signals indicating potential errors in paradigms. For example, once committed to a mental institution, proving the absence of mental disease is not possible under psycho egoism. Ethical egoism implies that altruism is an invasion of privacy

which creates unnatural dependencies among people, unless a real difference may be identified which justifies the special treatment. Not surprisingly, endless debate over the "realness" of this or that difference forms the major part of the debate. Ethical egoism is also based on self interest. Forms of ethical subjectivism may also enter into debates under the cloak of doing what is right. Vindication of personalistic ethics is usually experienced long after the fact. Approach 10 arises from personal conviction being important for having and applying integrity to situations. Values, coupled with virtues, we assert, are essential. Challenges arise when those who claim spokesmanship for God legislate behaviors (ethics) often associated with particular values.

Many add approach 11 to the top (or bottom) of the hierarchy. The divine command and natural law ethics were articulated in the middle ages. Both build on the premise that to have ethical laws there must be an ethical lawgiver. The idea of *divine command* implies there is a God and God's will is best for us. The idea of natural law implies that God and God's will can be discerned from nature. Over reliance on Natural law can result in the is-ought fallacy, a confusion of what ought to be versus what is. Although *ethics* associated with number 11 can be diverse, commonly held individual *values are essential* for a group to work together successfully.

We generally apply approaches 7, 8, 9, 10 and 11 in a hierarchical way (Hitt, 1990, 1998). Aspects of numbers 1 through 6 figure into the 7-11 ethical hierarchy. Each individual is generally unique in how they order ethical hierarchies. Underwood (1998) summarizes many ecologically related controversies. It is interesting to study various cases to decide which values the various proponents held. Table 2. Summary of historical ethical positions or world views.

Number	Ethical approach	Leading proponent if known	Issues or difficulties
1	Might is right, where might is land, labor, capital, technology.	Thrasymachus (character in Plato's Republic)	It is possible to be good without power and powerful without good; "possession is 9/10ths of the law" Subjective and/or relativistic ethics
2	Morals are mores		Ethics are ethnic (e.g., racial) Subjective and/or relativistic ethics
3	Man is the Measure	Protagoras (480?-411? BC) Hare (1952)	Each person's own will is the standard for defining right and wrong. The act of assertion makes it right (Positivist). Subjective.
4a 4b	Human Race the basis of right Biosphere the basis of right	(e.g., see List, 1993; Nash, 1989; Leopold, 1966)	Does not allow for dissent; has in the past allowed child sacrifice, slavery; Who speaks for the human race? Who speaks for the biosphere?
5	Right is moderation	Aristotle (384-322 BC)	Some virtues are inappropriately expressed in moderate amounts
6	Right is what brings pleasure (hedonism)	Epicurius (341-270 BC)	What kind of pleasure should be used for the test?
7	Right is the greatest good for the greatest number (Utilitarianism)	J.S. Mill (1806-1873)	Does not confront the issue of what is "good". Can be a modern version of hedonism.
8	Right is what is desirable for its own sake; Rule based ethics (Kantianism; Deontology)	Immanuel Kant (1724-1804)	Can lead to "goodness" being defined not by the means but by the ends; easy to confuse what is being desired vs. what ought to be desired. People

			regarded as an end, not a means to an end.
9	Right is indefinable "Spirit" or Consciousness based ethics (Contractualism)	Rousseau (1712-1768) G.E. Moore (1873-1958)	Attempts to define "good" fall prey to the "naturalistic fallacy" of assuming since one can attribute pleasure to "good," they are identical.
10	Ethics is personalistic Virtue-based theory	Martin Buber (1878-1965) Karl Jaspers (1883-1969)	Each person defines their own ethics; can lead to anarchy. Can allow psycho egoism or ethical egoism to unconsciously control . Can be subjective.
11	Good is what God wills - some of items 7 through 9; Divine Command Natural order	Many religions St. Augustine Thomas Aquinas and others	Can lead to authoritarianism when people place themselves between people and God; views of the nature of God vary widely even within the major religions. Can become rule based; Provides compelling ideas.

The shaded viewpoints are the modern predominant ethical positions.
Source: adapted following Geisler, 1989.

II. Ethical concepts and the environment

Despite one's philosophical world view, most people accept that human activities have interrupted or disturbed many ecological processes throughout history. We have altered many aspects of nature. Some believe, or even insist, that nature will restore itself, if we stop intervening with its processes (List, 1993). Without commonly held philosophy and belief systems, society must use various governmental problem solving mechanisms for consensus development. Values are not necessarily right or wrong. Achieving a consensus requires identifying and balancing values of the group.

The growing environmental and societal concern about engineered products creates a compelling need to consider these factors in the *design phase*. Direct and indirect impacts of modern technology on environment and human society and quality of natural resources likewise creates compelling need to evaluate design methods. Today, customers' concerns go beyond mere technical specifications and economic affordability. They include short and long term impacts of manufacturing, use/operation, and retirement of industrial products. University and government researchers are currently proposing design methodologies which attempt to capture key social elements (e.g., Esteghlalian et al., 1999; Bouchard, 1999). These approaches build upon QFD ideas. These ideas will become more important as one moves into management.

The appearance of ISO14000, an international standard for strategic environmental management, is perhaps the most comprehensive societal response to perceived environmental stewardship needs (Tibor and Feldman, 1997). ISO14000 lays out an environmental management protocol. The standard lays out comprehensive approaches for documenting initial review, processes, employee training, supplier management, record keeping and audits. The growing realization that good environmental stewardship enhances profits over time furthers the adoption of ISO14000. The act of forming ISO14000 standards could be construed as beginning

personalistically, debating to include this concept in the social contract, leading to codification, all in the name of creating status for utilitarian distribution. Accomplishment of these goals in religiously pluralistic society is a continuing challenge.

The act of forming ISO14000 and other standards and design methodologies beginning personalistically, debating to include this concept in the social contract, leading to codification, all in the name of creating status for utilitarian distribution is beginning to be incorporated in ecological design methodologies. Design methodologies considering fundamental environmental qualities and desirable societal attributes respond to such needs and concerns (Wann, 1996; Orr, 1994).

III. Case study --clean water act compliance - hypothetical case[2]

The state agency for Protection, Licensing, Investigation and Compliance - Environment (P'LICE) has determined that a certain stretch of a river in the state exceeds water quality standards for dissolved oxygen (DO). P'LICE is one of those state agencies to which EPA has delegated the authority to administer the Clean Water Act program within its state borders. As part of that delegation, P'LICE submits lists of so-called "impaired waters" not meeting water quality standards to EPA on a two-year cycle.

The City of Blissful operates a wastewater treatment plant which discharges into the stretch of river P'LICE has listed as impaired for DO. This discharge is pursuant to an NPDES permit issued by P'LICE. One pollutant regulated under the City's permit is biological oxygen demand (BOD). The permit is coming up for renewal and P'LICE is threatening to make the BOD limits in Blissful's permit much more stringent to improve the DO content of the listed stretch of the river. Blissful's consultant estimates meeting the new DO limit proposed by P'LICE will require construction of a $10,000,000 addition to the wastewater treatment plant.

Agriculture Is Us, Inc. operates an animal feeding operation (AFO) which discharges nutrients into the affected stretch of river. In addition, there are homes on both sides of the listed stretch of river having old septic tanks known to be leaking. P’LICE currently regulates neither of these activities.

The Mayor of Blissful held a town meeting to discuss the anticipated tightening of permit limits by P'LICE and the proposed $10,000,000 expenditure which would be funded by increased taxes on users of the wastewater treatment system (industrial, commercial and residential) and the issuance of bonds. The Mayor expressed regret for imposing these additional user fees. He said he had no choice because Blissful needed

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[2] Presented courtesy of Harvey A. Rosenzweig, TroutmanSanders LLP, Atlanta, GA.

the permit to continue to operate the plant, and failure to comply with new permit limits could result in severe fines. During the meeting, some of those present suggested that Agriculture Is Us, Inc. might be responsible for part of the problem. Representatives of Agriculture Is Us, Inc. responded that they were utilizing Best Management Practices (BMPs) to control any pollution from their operations and that, in any event, more likely sources of the problem, were Blissful's treatment plant and leakage from old septic tanks utilized by homeowners. The meeting ended in a shouting match among the various factions present.

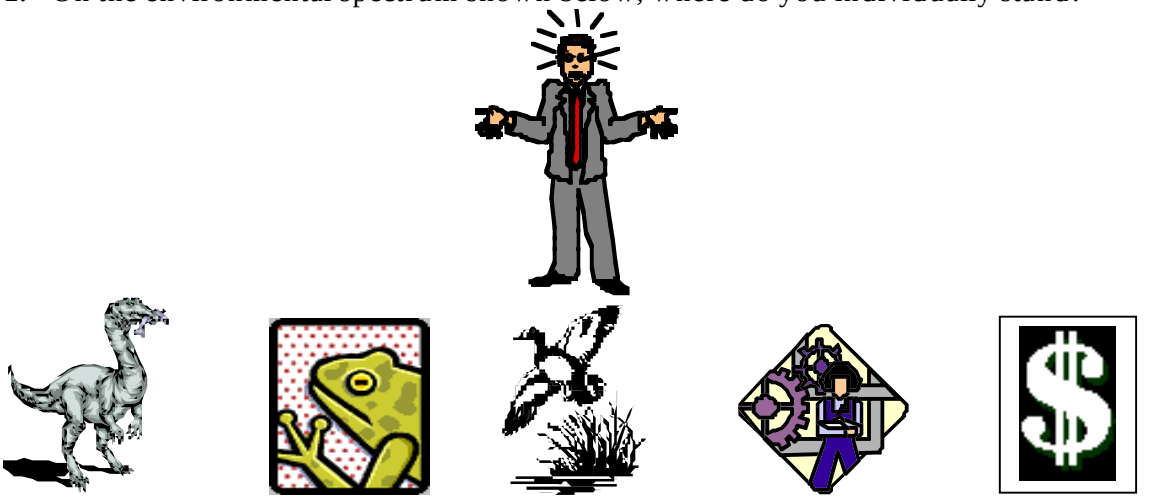
How can one resolve this issue?

1. Collect data to determine the relative contributions of Blissful, Agriculture Is Us and othe
1. Determine if control of sources other than the Blissful treatment plant would result in sufficient improvement of the DO content in the river to allow it to be removed from the impaired waters list.
3. Determine if one could achieve significant reductions in discharges of oxygen-demanding substances from sources other than the Blissful treatment plant at costs significantly less than the $10,000,000 proposed for the treatment plant addition.
4. If the answer to No. 3 is "yes", work out an agreement under which Blissful would fund part or all of the cost of controlling these other sources.
5. Present this agreement to P'LICE with the request that P'LICE issue an administrative order making the terms of this agreement enforceable.
6. Why are we worried about the river in the first place? Threats of the River keepers? Rights of fish and other organisms in the river? Regulatory pressure? Desire to do what is right? Desire to follow the golden rule? I came along after you were here and I have as much right to the river as you do? Others?

Additional case studies are presented in Anon. (1999).

IV. Ethics Case Study Discussion Exercise

1. On the environmental spectrum shown below, where do you individually stand?



1	3	5	7	9
Strict Preservationist	Naturalist	Conservationist	Wise Use	Strict Objectivist Economist

2. Identify the key facts relevant to addressing the assigned case study issue (in small group discussion). Use the questions at the end of the exercise as a guide.

   Interpret these facts in light of the positions noted along the environmental spectrum in item one.

   As your discussions progress, identify discussion threads of other group members which reveal ethical positions (use Table 2). By next period, each person should summarize one or two threads and how they may relate to ethical positions of Table 2. Group discussion is permissible.

5. Answer the case study question (individually).

6. Where is your position on the continuum now? Why?

V. Experiences with the exercise

This exercise is very much a work in progress. The goal of question 1 is to separate the position from the individual so it can be discussed. Most students have been selected to be on the right hand side. True homogeneity is hard to achieve in most engineering classrooms. Moves to incorporate more ecology in the Natural Resources Engineering curriculum may bring the left hand side perspective into the picture.

Students typically do very well with question 2. Responses to question 3 are somewhat limited due to reasons mentioned in conjunction with question 1.

Question 4 represents a major challenge. “Why is this being talked about here?” frequently comes up in discussion. Sometimes I as an instructor wonder why I bring it up. I bring it up in the hopes that some will be inspired to think about the subject beyond the class.

Question 5 is usually handled fairly well. The Utilitarian view generally leads to workable results. Question 6... some have shifted their positions by 1 degree, usually to the right.

The measure of success of an ethics exercise is not how well the students participate in it. Does it change their perspective? This is hard to measure. Do I as an instructor harken back to the exercise in subsequent discussions? Not as much as I should. The introduction of ethics requires diligent instructor and student participation.

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