

Preface

Ethics is a field of study that examines the moral basis of human behavior and attempts to determine the best course of action in the face of conflicting choices. Ethics is central to our human experience and provides an organizing dimension to human interaction. *Because it invokes questions that consider morals, values, and principles, and because it seeks to consider and respect alternate viewpoints, it is a key component to living within a society in a civilized way.*

There are several ‘essential understandings’, or core concepts, that are important to communicate to students about ethics. We hope to foster among students an understanding of the *importance of well-reasoned judgments*, combined with a *respect and empathy for other approaches*.

1. Intellectual Rigor: The Importance of Well-Reasoned Judgments

Students need to learn to differentiate opinions based on emotions from those supported by evidence and logical argument. A key misconception among students is that ethics is a matter of opinion (the issue of moral relativism), and that therefore ethical issues are not worth discussing or cannot be resolved. The discipline of ethics stresses an analytical approach to evaluating issues. Successful arguments are both well-reasoned and clearly articulated. A *solid understanding of science content* provides the foundation from which students can develop their positions. What matters most is not which position students take, but how thoroughly they have analyzed the ethical dilemma and how well-justified and supported their arguments are.

2. Citizenship in a Democratic, Pluralistic Society: Respect for Alternate Approaches and Viewpoints

Ethics allows students to gain greater understanding and respect for other positions and approaches, even if they do not agree with them. It enhances their ability to understand the issues and values informing different points of view, and thus makes them better citizens within our democratic and pluralistic society.

Students should also be aware that in certain contexts, well-reasoned judgments can sometimes be used to support morally unacceptable practices. The ethical perspectives of some stakeholders may be morally reprehensible to others. It is important to stress that at the community and societal levels not all values are deemed equally significant.

An Ethics Primer



What Makes Ethics Unique As a Discipline?

What Are the Most Important Ideas and Concepts to Teach Students About Ethics?

How Does Ethics Differ from Morals and Values?

Values are qualities that signify what is important and worthwhile. Values serve as the basis for moral codes and ethical reflection.

(‘Life is to be valued, in other words life is sacred’)

Individuals have their own values based on many aspects including; family, religion, peers, culture, race, social background, gender, etc. Values guide individuals, professions, communities, and institutions.

Morals are codes of conduct governing behavior. They are an expression of values reflected in actions and practices.

(‘One should not kill’)

Morals can be held at an individual or communal level and are culturally bound.

Ethics provides a systematic, rational way to work through dilemmas and to determine the best course of action in the face of conflicting choices.

(‘If killing is wrong, can one justify the death penalty or kill in self defense?’)

Ethics attempts to find and describe what people believe is right and wrong, and to establish whether certain actions are actually right or wrong based on all the information available.

Paul and Elder (Paul 2003) point out that there are three main kinds of reasoning in response to three different types of inquiry: First, factual questions require objective evidence in the form of a correct answer. Secondly, opinion questions call for a subjective preference in the form of a value-laden answer. Third and finally, multi-system questions require an answer based on rigorous reasoning and sound principles, in other words, “reasoned judgment”.

While the first two types of questions (factual or opinion) are not significantly controversial in a democratic society, the third type of question is often very contentious in that it can become confused with the others. Often, students will make statements of ethical absolutism - “There is ONE right answer!”, or else they will espouse ethical relativism - “Well, it’s all just relative—you see it your way and I see it my way!” When educators help students see beyond these two extremes, they open up possibilities for understanding the range of perspectives that exist, and acknowledge that ethics stresses the logic and quality of the argument that is being made.

Having students engage in disciplined inquiry and discourse that requires reasoned judgment helps them move beyond mere “fact or opinion” analysis and is essential in a democratic society.

(Merriam-Webster online definitions provided in italics)

Ethics

The discipline dealing with what is good and bad and with moral duty and obligation, a set of moral principles or values, a theory or system of morals, the principles of conduct governing an individual or a group, a guiding philosophy.

We often confront puzzling situations. An ethical dilemma is a special type of puzzling situation that involves one or more competing moral solutions. Ethical analysis helps us in such situations when moral confusion is involved.

Dorothy Wertz (Wertz 1996) defines the discipline of ethics as “a system of inquiry that examines the bases of human goals and the foundations of ‘right’ and ‘wrong’ human actions that further these goals.” Furthermore, unlike morality and morals, which are culturally bound, ethics seeks to arrive at reasoning and principles that are more universally applicable in considering diverse perspectives and interests. The discipline of ethics strives for commonality that can be valued and practiced by many within the context of a pluralistic, democratic society. In other words, it attempts to meet the standard of valuing both individual rights and the common good.

Ethics provides us with a common language that stands for widely shared values, such as those focused on human dignity. It seeks universal standards for reasoned judgments. The discipline of ethics provides a structured way to analyze dilemmas in order to come to well-reasoned positions.

Religion

The service and worship of God or the supernatural, commitment or devotion to religious faith or observance, a personal set or institutionalized system of religious attitudes, beliefs, and practices, a cause, principle, or system of beliefs held to with ardor and faith.

Hundreds of different religions exist, each with its own set of beliefs. People seek guidance from many religious traditions. Appealing to religious beliefs is an important way of seeking guidance, but justifications based on religion differ from ethical arguments. However, both perspectives based on religious traditions and ones based on ethical principles benefit from a reasoned approach.

In the U.S., our Constitution, our history of the separation of church and state, and our highly pluralistic society obligate us to rely on principles that are widely accepted in making decisions that impact many individuals. These principles are not unique to any particular religion, yet at the same time they are not necessarily exclusive of religion.

In public school classrooms, it is important to be sensitive to various family value systems regardless of religious persuasion. Teachers should enhance and support the work of parents as they guide the ethical reasoning and actions of their children in the home and in the community. Emphasis on treating people, including oneself, with civility, courage, fair-mindedness, care, respect, empathy, integrity, and kindness (beneficence) and in a way not to cause harm (nonmaleficence), helps lay the groundwork for students to value both diversity and the common good within a pluralistic society. These dispositions and principles cut across religious and nonreligious boundaries.

Sociology

The science of society, social institutions, and social relationships; specifically, the systematic study of the development, structure, interaction, and collective behavior of organized groups of human beings/ the science of mind and behavior, the mental or behavioral characteristics of an individual or group.

Social preferences or conventions are also distinct from ethics, again based on their cultural variability. Because conventions are strongly and systematically ingrained, they are sometimes confused with ethics.

Law

A binding custom or practice of a community, a rule of conduct or action prescribed or formally recognized as binding or enforced by a controlling authority, the whole body of such customs, practices, or rules.

Although one would hope for a strong connection between ethics and the law, what is legal is not necessarily ethical, and vice versa. Many societies have enforced unjust laws based on discriminatory views, for example. Similarly, authority can be used as a justification for a particular decision, without reference to an underlying ethical basis.

What is the Relationship Between Science and Ethics?

In the classroom, students must understand the appropriate science content before they can fully evaluate related ethical questions. An understanding of the scientific background behind an issue will help provide factual information in support of reasoned ethical judgments.

Both science and ethics ask questions that seek to understand the world. The importance of reasoned analyses, systematic thinking, and rational arguments is central to both scientific and ethical disciplines. Both rely on a logical decision-making process as well as a clear rationale and justification for conclusions. For teachers who strive to foster thinking skills in their students, ethics provides a powerful tool for cultivating such habits of mind.

For both science and ethics, cultural subtexts are important to examine. Some of the cultural subtexts inherent in western science include the value placed on knowledge, the importance of integrity to the scientific process, and the inherent complexities associated with funding issues and the pursuit of success. In western ethical practice, a high value is placed on autonomy and individual rights and freedoms.

Most scientific issues have some ethical dimensions. Ethics can help provide the framework by which science should be conducted and technology developed. However, there is an inherent tension between the belief that science is a value-neutral process and the concept of scientists as having social responsibilities. John Pomery (Pomery 1996) has pointed out that individuals who excel in highly technical fields such as science ('algorithmic thinkers') may reject applied ethics because of the perceived ambiguities inherent in the ethical dilemmas, and because of the pluralism that is necessary for contemplating other points of view. Such individuals may have expectations that important questions necessarily have clear "unambiguous answers, accessible to rational and logical persons through application of well-defined models." However, he stresses that highly technical understanding and reasoning must be balanced with sensitivity and awareness of issues inherent in a global, multicultural world.

Similarly, Fuchs (Fuchs and Macrina 2000) notes that some scientists may be "suspicious that 'soft disciplines' such as moral philosophy lack the same type of academic rigor displayed by their own fields," and that others may mistakenly view ethical positions as little more than matters of opinion. He notes that ethics falls somewhere between completely subjective preferences and objective data, but that such a position does not diminish the power of the discipline. Appreciation of the range of values and viewpoints of stakeholders involved in an ethical dilemma, and of the interconnectedness, complexity, and ambiguity inherent in real-world problems, may help students to transcend a stereotypical and oversimplified conceptualization of the world.

Why Incorporate Ethics into Science Classrooms?

“...if we decide that we do not have time to stop and think about right and wrong, then we do not have time to figure out right from wrong, which means that we do not have time to live according to our model of right and wrong, which means, simply put, we don’t have time for lives of integrity...” - Stephen Carter

The rapid pace of scientific innovation has not been matched by a parallel growth in the analysis of the ethical implications of new technologies. Science has been long conceived to be value-neutral, and many textbooks still proffer this view of science. However, because science is a human enterprise that is conducted in a social context, science and its technological applications clearly have ethical implications.

Teachers are faced with the formidable task of preparing students to recognize the issues inherent in a society increasingly shaped by science and technology. Discoveries in molecular biotechnology often put biomedical research on the front page. The sequencing of the entire human genome and the application of stem cell research, for example, herald a new age of discovery, but also raise difficult ethical issues that merit public awareness. Today’s young people will be the first to benefit from the revolutionary developments in molecular biology, but they will also be the first to face the challenging social and ethical questions such technologies raise. The difficult decisions that will face humanity in the upcoming centuries will not be solved by technological solutions alone. They will require both scientific understanding as well as consideration of the impact of alternate solutions on those involved, and reasoned justification based on ethical principles.

Students often come to class discussions with preformed opinions on many ethical issues. The challenging task for teachers is to help students learn to identify the facts of a case, recognize the underlying ethical dilemmas, and to understand the different perspectives involved.

Most students lack familiarity with ethics as a discipline, and consequently are unable to articulate their stance or participate in a reasoned discussion about ethical issues in science. As developing citizens, students require analytical skills to use ethical reasoning when considering scientific controversies. The role of the teacher includes encouraging students in their personal decision-making process while helping them learn to listen respectfully to the positions of others, to overcome prejudices, and to communicate their dissenting opinions reasonably and effectively. In such an educational setting, students are empowered to apply the same kinds of ethical reflection and critical-thinking to difficult situations they encounter elsewhere in their lives.

Because bioethical issues offer no single right answers or simple solutions, they can help students to think critically by fostering an understanding of the importance of logic and reason when approaching complex problems. A study of ethics helps students move more rigorously and emphatically towards better reasoned judgments/decisions based on standards and principles.

Lastly, ethics also provides a real-world, motivating context for understanding science and its relevance. In such a setting, scientific content is not isolated from its social context or from other disciplines, but can be viewed by students as part of a larger whole. Helping students grapple with ethical controversies and decision making in the classroom serves as an authentic rehearsal for their future life; it provides a real and relevant way for them to begin to acquire the skills and ethical dispositions necessary for future citizenship.

National and state standards recommend that students develop a set of cogent views of the world as illuminated by the concepts and principles of science. Moreover, the standards stress the importance of students becoming aware of the influence of society on science and technology, and the integration of science with daily life and other disciplines. In achieving these goals, students are not only poised for academic achievement, but are also equipped with skills to become responsible and informed members of an increasingly complex and inter-connected world.

The National Science Education Standards point clearly to the need for teachers to not only provide students with a solid grounding in science content, but also with an understanding of ethical implications of science and the human context in which science occurs. The Standards state that understanding basic concepts and principles of science and technology must precede active debate of their economic, political and ethical issues. Moreover, the Standards ask that students be able to understand and evaluate costs and benefits associated with technological advances. For example, Life Science Content Standard F, Science in Personal and Social Perspectives, indicates that as a result of activities in grades 9-12, all students should develop understanding of science and technology in local, national, and global challenges. In addition, Life Science Content Standard C describes the need for students to understand the molecular basis of heredity, and also describes the importance for students to take informed positions on ethical aspects of developing biotechnologies.

How Does Ethics Relate to National Science Education Standards?

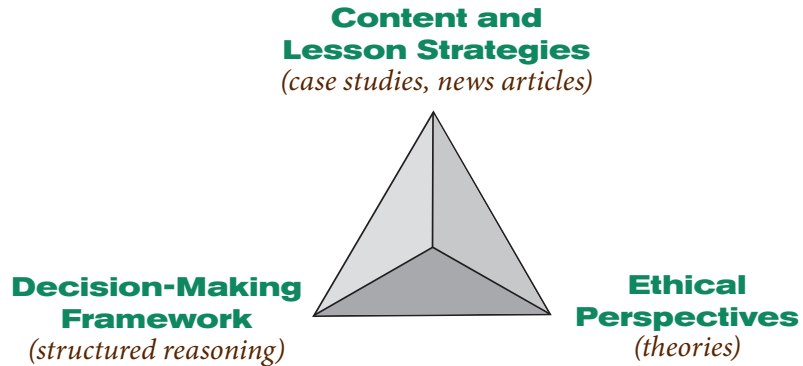
The Benchmarks for Science Literacy from the American Association for the Advancement of Science's Project 2061 address similar themes as they define content standards for Habits of the Mind and the Nature of Science. Benchmark 1.C makes clear that science is a social enterprise and has its own system of ethics. It stresses the abundance of current issues that call attention to the importance of ethics in science, and offer support for the case-study approach as a tool for teaching ethics. Benchmark 8.F in particular stresses the importance of addressing the ethical dimensions of emerging biotechnologies.

National science education standards emphasize the importance of teaching bioethics and the social implications of biological discoveries. An ethical framework and skills for decision-making will allow students to apply their understanding of science content to the formation of their own positions, and will promote effective citizenship.

Key Elements

Three components are key to promoting effective teaching and discussion related to ethics and science: content as delivered through lesson strategies, a decision-making framework, and a familiarity with ethical perspectives. These elements are represented diagrammatically in Figure 1 below.

Figure 1.
Key Elements for Successful
Teaching of Science and Ethics



Content and Lesson Strategies

Three components are key to promoting effective teaching and discussion related to ethics and science: content as delivered through lesson strategies, a decision-making framework, and a familiarity with ethical perspectives. These elements are represented diagrammatically in Figure 1.

We *strongly* recommend that the study of ethics begin through the exploration of a case study or similar content. Analyzing the various dimensions of a scenario leads naturally to a discussion of the need for the other elements. Students are apt to become overwhelmed if they encounter the ethical perspectives for the first time before they have been presented with an ethical dilemma.

The science content and strategies provide the ‘hook’ for student engagement. Case studies make excellent starting points for ethical discussions, and can be found in textbooks, on specialized web sites, or can be taken directly from the news. Several publishers provide ‘pro and con’ position papers on ethical issues related to science. Teachers have also had success beginning a discussion with a movie or a vignette from a movie.

The Ethics Primer provides a range of strategies that can be used interchangeably with many different science content topics. Please consult the ‘Ethics Classroom Strategies Chart’ for an overview of different lesson ideas.

When evaluating an ethical dilemma involving science, it is necessary for students to have a solid understanding of the science behind the issue. Ethical dimensions of science should ideally be taught in conjunction with science content, rather than as an ‘add-on’ when time permits. Not only does the study of ethics provide a social context for science, but it also creates a ‘need to know’ that motivates students to learn the science.

Even a rudimentary introduction to ethical perspectives and theories does much to deepen student discussion and involvement in dilemmas. Some exposure to the discipline of ethics provides students with the language to give shape to their thoughts. Different ethical perspectives/theories provide the basis from which students can consider what kinds of questions can be asked in an ethical dilemma. The Primer section entitled ‘Ethics Background’, provides background on these perspectives.

Many teachers find it easiest to begin with what are widely referred to as the ‘Four Principles’ of bioethics: respect for persons/self-determination (autonomy), beneficence (do good), nonmaleficence (do no harm), and justice (treat others equitably, distribute benefits/burdens fairly). Beneficence and nonmaleficence are closely related and are sometimes grouped by ethicists under the broader heading of ‘utility’, (Veatch, 2003) and could also be combined for classroom use. Principle-based ethics provides a familiar form of reasoning for students, and it is fairly concrete for teachers as well.

Ethical Perspectives/Theories

After becoming comfortable with Principle-based ethics, teachers often progress to teaching about other ethical perspectives. In the Ethics Background Summary for students, five general perspectives are presented (Outcomes, Rules, Principles, Care, and Virtue). While there are additional perspectives that are not included, these five represent some of the major ‘schools of thought’ in ethics.

Decision-Making Framework

Traditional ‘Science-Technology-Society’ (STS) approaches have achieved limited success, mostly because they lack a coherent pedagogical theory, attention to ethical issues, or focus on the moral development of students (Zeidler 2004). These problems can be addressed by introducing students to models for critical reasoning, as well as by supporting their understanding of ethical perspectives.

Too often, teachers provide the starting content only, and then ask students to ‘discuss’ the issue or justify their position. Pairing the content with a decision-making framework helps students to organize their thoughts and to craft their positions in a logical way. It may be instructive to have students reflect on the process they use when making decisions related to ethics in their own lives, and articulate their own model.

While several decision-making models exist, the one developed by the Hastings Center (Campbell et al. 1990) is particularly useful. Please see the section on Decision-Making Frameworks for additional information.

The three components described work synergistically in supporting informed ethical discussion in the science classroom. Teachers report that using these methods energizes their science students, often engaging individuals for whom science seems abstract or uninteresting. Parents have remarked that their students are more aware of the different perspectives and positions that can be taken on an issue. We hope that these strategies will allow teachers to more confidently address ethical issues in science with their students, thereby fostering student understanding of science as a social enterprise. The skills acquired by students are useful not only in the science classroom, but translate into lifelong skills for responsible citizenship.