

HOW TO HAVE A SUCCESSFUL SCIENCE AND ETHICS DISCUSSION

*Three key
components
for effective
classroom
bioethics
experiences*

Jeanne Ting Chowning

Most of the secondary science teachers who shy away from incorporating ethics into their curricula are quite clear about the reasons they do so. Some teachers are uncomfortable with teaching ethics, a subject that science teachers often have very little experience with. Ethics as a discipline is full of unfamiliar terms and its own jargon. Other teachers fear classroom discussions getting out of control, degenerating into a battle of opinions, or having parents and administrators confuse teaching *about* values and morals with teaching *particular* values and morals. In addition, something as seemingly subjective as ethics can be perceived as somewhat out of place in a science classroom, where the focus is ostensibly on objectivity: “Why are we studying values in science class?” Ethics, to many teachers, seems like just one more element in an already crowded curriculum.

For the past six summers, the Northwest Association for Biomedical Research (NWABR) has provided an in-depth weeklong professional development program for teachers titled “Ethics in the Science Classroom.” This program, funded by a Science Education Partnership Award from the National Center for Research Resources at the National Institutes of Health, has provided nearly 150 teachers with background in ethical reasoning and science content related to controversial issues. In addition, these teachers have prepared lessons related to ethics and science for use in their classrooms. Over 30 such lessons are available online at www.nwabr.org. The website also provides the preliminary draft of an Ethics Primer, a resource guide containing interactive lesson ideas and background on ethics as a discipline. Through this workshop and subsequent discussions with teachers, I have developed a model that focuses on the three key



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components for successful classroom bioethics experiences. In this article, I will review each component and discuss its use in the classroom.

Why incorporate ethics into science teaching?

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. 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 foster an understanding of the importance of logic and reason when approaching complex problems. Ethics provides an authentic, 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.

Three components are key to promoting effective discussions related to ethics and science: content and lesson strategies, a decision-making model, and a familiarity with ethical perspectives. These elements are represented in Figure 1 (p. 48).

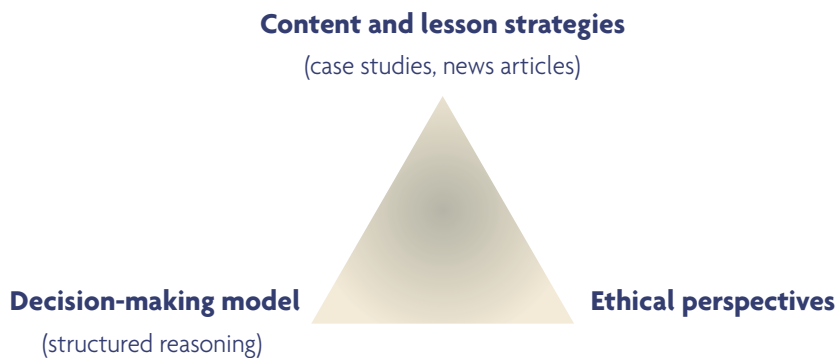
Content

The content provides the “hook” for student engagement. Case studies make excellent starting points for ethical discussions and can be found in textbooks, on specialized websites such as <http://bioethics.net>, or can be taken directly from the news. Several publishers such as Greenhaven Press and McGraw Hill provide position papers on ethical issues related to science. Teachers who have participated in NWABR’s program have had success beginning a discussion with a movie or a vignette from a movie such as *Gattaca*. The Kennedy Institute of Ethics offers



FIGURE 1

Key elements for a successful ethical discussion.



case studies freely available to teachers as well as lists of movies with bioethics themes. The institute also provides a film lending library (Kennedy Institute of Ethics 2005).

When evaluating an ethical dilemma involving science, students must 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 content.

Decision-making framework

Traditional Science-Technology-Society (STS) approaches have achieved limited success, mostly because they often lack a coherent pedagogical theory, attention to ethical issues, or focus on the moral development of students (Zeidler et al. 2005). These problems can be addressed by introducing students to models for critical reasoning, as well as by supporting understanding of ethical perspectives. Too often, teachers provide the starting content only and then ask students to discuss the issue or justify their positions. Pairing the content with a decision-making framework helps students organize their thoughts and 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 (Jennings et al. 1990) is particularly useful and serves as the basis for the framework discussed in this article. A student handout version of the decision-making framework is provided in Figure 2.

Ethical question

First, the decision-making framework asks students to consider the ethical question. This is in itself not trivial—awareness that an ethical dilemma actually exists re-

quires “moral sensitivity,” which often needs to be cultivated (Rest 1984). Often, students will identify the ethical question only to return and modify it later. An ethical question often (but not always) includes the word *should*, and is characterized by the fact that several competing solutions exist. In reflection of the moral nature of the dilemma, none of these solutions is without its problems, concerns, or issues. Examples of such questions include, “In which cases, if any, is the use of animals in research ethically justified?” “Is it ethical for scientists to pursue embryonic stem cell research?” or “How should donated organs be allocated?”

Facts: Known and unknown

Students then determine which facts relevant to the question are known and which still need to be researched. If time permits, students can research the issue more deeply. This is an excellent place to incorporate additional science content. From additional research, or from content provided from the teacher, students identify stakeholders and their values.

Stakeholders and their values

One of the most rewarding aspects of having students consider the position and values of different stakeholders is that it asks them to step into someone else’s shoes. While this is a valuable exercise at any age, it is particularly important for young people who may struggle to view dilemmas from different perspectives. Such practice is also important for developing citizenship skills in students. In order to participate effectively in a pluralistic, democratic society, students need to be able to understand different perspectives, even though they may not agree with them.

Teachers can generate a list of stakeholders with their students, and then, in a classic case-study approach, have students form stakeholder groups consisting of a single stakeholder position. Students discuss the values their stakeholder might bring to the issue, and the range of positions that the particular stakeholder might take. Next, the teacher can form mixed groups with one representative from each original stakeholder group in order to address an ethical question.

Possible solutions

Students are asked to generate several options for solutions. This is a brainstorming step, in order to provide a wide range of ideas. Thinking about solutions that different stakeholders would propose is one strategy.

Solutions can be analyzed to consider which ethical principles are granted priority in each case.

Decision and justification

When presented with an ethical dilemma, students are apt to quickly jump to their decision/position, without a sense of their justification. Alternatively, students may express that their position is simply what they believe or what intuitively feels right. The justification of the decision is a key element of the model. This section allows students to practice clarifying their reasoning. Here is where students can bring in their understanding of ethical perspectives and theories (highlighted in the next section) in order to provide depth to their arguments. For example, ethical perspectives can help students clarify which of the possible solutions provides the best outcome for the greatest number (an outcome-based perspective). If students are working as

a group, they can be asked to come to consensus or clarify the nature of their disagreement.

Action/evaluation

The last steps consist of acting on the decision and evaluating the decision. Students should be aware that they could change their decisions in light of new evidence or information. Many elements of this problem-solving strategy are shared with scientific decision-making processes. The focus is on a reasoned, thoughtful methodology rooted in critical thinking.

Ethical perspectives

In observations of ethics teaching in science classes, even a rudimentary introduction to ethical perspectives does much to deepen student discussion and involvement in dilemmas. Some exposure to the discipline of

FIGURE 2

Student handout: Ethical decision-making framework.

Ethical question: **(Note:** Questions such as “In which cases, if any, is the use of animals in research ethically justified?” “Is it ethical for scientists to pursue embryonic stem cell research?” or “How should donated organs be allocated?” can be used here.)

<p>1. Relevant facts (known)</p>	<p>2. Questions that remain (unknown, need to know)</p>
<p>3. Stakeholders (people or entities affected by the decision)</p>	<p>4. Values/concerns of each stakeholder</p>
<p>5. Possible solutions</p>	
<p>6. Decision and justification (refer to the ethical perspectives in your justification)</p>	
<p>7. Take action and evaluate the process</p>	

Addressing the Standards.

The National Science Education Standards (NRC 1996) 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 economical, 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, Content Standard F: Science in Personal and Social Perspectives, indicates that all students should develop understanding of science and technology before debating local, national, and global challenges (NRC 1996, p. 199). Life Science Content Standard C describes the need for students to take informed positions on ethical aspects of developing biotechnologies (NRC 1996, p. 181).

ethics provides students with the language to give shape to their thoughts. Different ethical perspectives provide the basis from which students can consider what kinds of questions can be asked in an ethical dilemma.

Many teachers find it easiest to begin with what are widely referred to as the four principles of bioethics (The Belmont Report 1978; Beauchamp 2001): autonomy/respect for persons (respect an individual's right to make self-determining choices); 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 provide a familiar form of reasoning for students and are fairly concrete for teachers as well. After becoming comfortable with principle-based ethics, teachers often progress to teaching about other ethical perspectives (**Editor's note:** For a description of the five major ethical perspectives along with definitions of the terms *values*, *morals*, and *ethics*, visit the online version of this article at www.nsta.org/highschool#journal.)

The three components described in this paper 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 children 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. ■

Jeanne Ting Chowning (jchowning@nwabr.org) is Education Director for the Northwest Association for Biomedical Research, Seattle, WA.

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Editor's Note

Clones, Cats, and Chemicals, published by NSTA Press, provides short readings that can initiate classroom discussions on ethics. For more information, visit NSTA's Science Store at <http://store.nsta.org>.