

ETHICS IN THE BIOLOGICAL AND OTHER SCIENCES

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ABSTRACT—This paper is based on many years of experience as a faculty member, administrator, and student. The presentation is about issues related to those experiences as well as a discussion of recent research and findings that may lead to an assessment and reevaluation of teaching styles and expectations. Views of faculty and students are a significant part of the paper. Issues about truth and a more comprehensive discussion about ethics and values are presented. These include acquisition of ethics and value systems, faculty responsibility for teaching ethics and value systems, understanding the broader parameters of ethical behavior, and the importance of attitude in enhancing ethical growth and behavior. Some discussion is included on case studies in ethics and how they can be used to advantage in strengthening the science curriculum. Personal revelations about the importance of a major professor are included as well. Major conclusions include: discussions about ethics and value systems should be included at every level of teaching and research in the university; the most important source for acquisition of ethical and value systems is from advisors, major professors, or other persons who serve as role models; and some researchers tend to work toward minimums rather than toward maximums in ethical behavior (e.g., “this research is not funded by NIH, do I have to follow the rules concerning ethics?”).

With many years of service in higher education as both a biological sciences faculty member and university administrator and several years before that as a student, I believe I have gained some insights into value and ethics systems worth sharing with you. A major part of my professional life has been consumed by a realization that many shades of gray do exist and that opinions about right and wrong are several times as plentiful as the number of individuals expressing those opinions. This is contrary to the rigid positions I harbored as a student and as a young professional in the biological sciences. I believe this is called mellowing with age. Regardless of the evolution of my thoughts on this issue, there have been common threads prevailing over the years that have guided me to my present views. These threads are best captured in the Four-way Test proposed and developed by Herbert J. Taylor, President of Rotary International in 1954-1955, and now expressed as a motto by Rotarians around the world (Rotary International, 1987). The Four-way Test is as follows: 1) is it the truth; 2) is it fair to all concerned; 3) will it build goodwill and better friendships; 4) will it be beneficial to all concerned.

Looking beyond the civic endeavors which engendered this motto, there is little in it other than a concern for ethical behavior. I can think of no improvement to offer, except, perhaps to change the word “all” to “most” (more about that later). Although ethics as a subject is far more complex than I imply here, I believe the Four-way Test is an excellent point of departure for looking at our responsibilities, whatever our assignment in a college or university setting.

Perhaps, the only part of the Four-way Test that is in direct agreement with ethical principles is the first question: “Is it the truth.” We in the sciences continue to look for truth in our teaching and our research. Our research is intended to obtain results that are unbiased, accurate, and defensible. We hope we are not like the lawyer in the following story. A young researcher decided to inquire of various professionals as to the sum of $2 + 2$. He first asked an engineer, whose immediate response was “4.” He then asked a biochemist, and the response was “ $2 + 2 = 2$.” The biochemist explained that if you combine two molecules of glucose with two molecules of fructose, you

get two molecules of sucrose. After other various responses, he stopped by an attorney’s office. The attorney was asked the question “How much is $2 + 2$.” The attorney said, “Please come into my private office.” He closed the door, and both sat down. The attorney asked again, “What was the question.” The young researcher responded, “How much is $2 + 2$.” The attorney, almost in a whisper, said, “How much do you want it to be.”

I now want to examine some issues in ethics and values which are concerned with a broader agenda than simply finding the truth. How are ethical values acquired? What is our responsibility for teaching them? Let us begin by looking at some recent research findings on the acquisition of professional values and sensitivity to ethical awareness.

Swazey (1993) reported on *Findings from the Acadia Institute Project on Professional Values and Ethical Issues in the Graduate Education of Scientists and Engineers*. Swazey, President of the Acadia Institute in Bar Harbor, Maine, pointed out that graduate students of today are the principal sources of tomorrow’s teachers and researchers. Her research included surveying 2,000 doctoral students: 500 from chemistry; 500 from civil engineering; 500 from microbiology; 500 from sociology. The students evaluated the importance of 10 different influences in shaping their values, both professionally and ethically. The top three were supportive faculty members, other graduate students, and family. The bottom three were discussion of values and ethics in courses, laboratories, and seminars; professional organizations in their field; and courses dealing with ethical issues.

Even with “supportive faculty members” being number one in the survey, it was surprising to learn that we probably are not doing our jobs as thoroughly as we could or should. Swazey points out: “The most frequent types of activities or behaviors by *particularly supportive faculty members* are (1) to express continuing interest in a student’s progress (the only item ranked a lot by over 50% of all respondent groups.), (2) to write letters of recommendation, and (3) to help students get financial support.”

Swazey found that much smaller percentages of students reported receiving helpful criticism on a regular basis on such subjects as details of good research practice, teaching, and developing professional relationships. A major conclusion of her work is that there is insufficient interaction between graduate students and their mentors in areas that are important parts of graduate training and professional socialization, even with faculty whom students consider to be especially supportive. I suspect this is true in undergraduate mentoring as well.

Swazey also surveyed 5,000 faculty in the same disciplines as the graduate students cited previously. They were asked to rate the effectiveness of seven ways that students can learn about professional values and ethical standards. The faculty responses were as follows (all percentages are for the response "very effective"): 1) interaction with faculty in research work, 65%; 2) informal discussion of ethical problems when they occur, 61%; 3) discussion of ethics and values in regular course work, 19%; 4) brown-bag session or colloquium, 18%; 5) special courses devoted to these topics, 14%; 6) department and university policies for teaching and research, 12%; 7) codes of ethics and professional standards provided by professional organizations, 7%. Swazey also found that most faculty believe values and ethical standards can be taught even with students who have advanced as far as doctoral studies.

In reflecting on Swazey's findings, the following thoughts occurred to me. In most institutions, faculty-student interaction, whether it be in a research, lecture-recitation, or laboratory setting, provides an excellent opportunity to address ethical issues. It is natural to be curious about events that are unusual or that differ from the accepted norm, and we should take advantage of such events as they occur, even if only for brief discussions. There are plenty of such events to choose from in our daily doses of politics, alleged misbehaviors of national figures, different international political ideologies, local and national cases of sexual harassment, and ethical issues concerning abortion. Current findings and activities in genetic engineering provide an almost endless parade of issues that can be debated in most of our classes in biology and biochemistry. Examples of genetic engineering in humans already in place or being studied (Mader, 1993) are: cells from early divisions of the embryo utilized to determine if an undesirable gene is present (if so, such embryos are discarded; if not, implantation attempts follow), e.g., Tay-Sachs disease, which affects Jewish people; ex vivo insertion of healthy genes which are returned to the human genome via recombinant DNA, hopefully to establish permanently the normal condition in that individual, e.g., severe combined immune deficiency syndrome (SCIDS); and insertion of recombinant DNA into bacteria which then produce such proteins as insulin and growth hormones. This list could and will continue as we already know >600 genes for medical conditions (Columbia Broadcasting System, 1994).

Also, do insurance companies have a right to our genetic information? They want to insure only healthy people and already are discriminating against individuals who have a family history of an undesirable trait whether the person to be insured shows the trait or not (Columbia Broadcasting System, 1994).

Those in public higher education in Tennessee are aware of the various programs in assessment of our graduates. In Tennessee Board of Regents Universities, growth in general education is measured by the assessment tool of American College Tests' College Outcome Measures Program (ACT COMP). A few years ago in the nursing program at Austin Peay State University, we became concerned about the performance of our nursing graduates on this assessment. After reviewing the weaker areas of the section "Clarifying Values," which included ethics, the nursing curriculum was enhanced with new and revised units that addressed the deficiencies. It was rewarding to note that, in the following 2 years, our nursing BSN graduates moved from the 49th percentile at entry to the 85th percentile at exit on growth in general

education in the section on "Clarifying Values," while enrolled in the junior and senior levels of nursing (J. Steele, pers. comm.). My point here is that planning in relating ethics and values to the topics of various curricula will create greater sensitivity and more appropriate responses to these issues in the daily thoughts and lives of our students.

In discussing the role of the faculty in teaching values and ethics, Lapidus and Mishkin (1990) stated, "above all, the advisor is a teacher, in both formal and informal settings, of a wide range of subjects ranging from specific techniques and experimental procedures to ways of thinking about research, science, and life in general." I am reminded particularly of my major professor, Dr. Aaron J. Sharp (Uncle Jack) who not only expended much energy and time on me and my research efforts in plant taxonomy but spent many evenings with me discussing life in general. We traveled together in my camper while I was completing the fieldwork for my dissertation which concerned red maples. In the evening, we would relax, eat dinner, and talk, about the maples, of course, but often about such topics as what was right, wrong, and permissible or accepting each individual based on his or her own merits. I doubt that this is representative of many of the relationships between major professors and their students, but it was a wonderful opportunity for me. Because of this relationship in which my horizons, sensibilities, and tolerances were broadened far beyond my expectations, I consider Jack Sharp to be the most influential person in my life. His most significant lesson was, and is, that truth must prevail.

If we relate our actions and thoughts today to what led us to the basis of our philosophies, most of us will find that we have modeled our ideas and behavior on one or a few significant individuals in our past associations. However, many of our institutions have done little to formalize the conditions of this relationship. The Office of Graduate Studies at Stanford is an exception in that it has published *Graduate Student Academic Advising Guidelines for Departments*. Those guidelines point out that "The goal of graduate education is to train the student to do independent research and scholarship; the process includes training to think clearly and critically, to conceptualize, argue, debate, challenge, and give an opinion, to understand and follow the ethics of the field..." They point out that mentoring requires role modeling, but that there should not be too much nonconstructive hand-holding and nurturing on the one hand and zealous efforts to train students to deal with the challenge of working independently on the other. Broad and Wade (1982) perhaps said it best: "The intimate bond that often grows up between the professor and his students is grounded in intellectual curiosity and a common commitment to the truth."

If I am to lead discussions about ethics in my classes, I need an acceptable model to guide those discussions. Most such discussions would be of cases that have been adequately publicized to provide a working background of information. An excellent model for this purpose has been provided by Velasquez (1988). Simply described, his model consists of having students move through the following seven steps in the course of a classroom discussion of a case: 1) determine the relevant facts; 2) identify the ethical issues; 3) develop alternatives for resolving the issues; 4) define the stakeholders for each alternative; 5) evaluate the ethics of each alternate; 6) take stock of the practical constraints; 7) decide on and plan implementation of an alternative. You may wish to explore this approach with some of your classes. If so, you will need to consult Velasquez's (1988) discussion of each of these steps. Continuing experience in the use of this or some other plan and paying attention to learning opportunities about ethics and value systems will promote your growth toward an adequate foundation for leading such discussions.

Case studies are fun and intellectually challenging and can serve as great teaching props. As an example of a case study, and in the hope that it might encourage you to use the case-study method, I offer the following. If I asked your opinion of the A. H. Robins Company's

arrangement to distribute the Dalcon Shield in 42 third-world countries after it was determined to be a major health risk in the United States, would you state this action to right or wrong? Probably, your initial reaction would be "wrong." However, if I told you that substantially fewer deaths would be caused by this contraceptive device than would be caused by the over-population that would occur in those same countries if the shield were not used, you might reconsider. Probably, few of us would agree that the Robins Company's action was "right," but, after weighing the morbidity statistics in the two scenarios, we might soften our stance and perhaps agree that the action was permissible. The Rotary Four-way Test discussed earlier would not sanction Robins' action because that action would not be fair or beneficial to "all" concerned. Fortunately, we can assess the Robins decision without regard for financial considerations that might bias our thinking and lead us to a wrong decision. I am not implying that the A. H. Robins Company had such a bias.

Final observations concern our ability to promote and care for each other in our daily professional activities. We must be consistent in our relationships with associates and in our comments and conversations about them. This consistency must exist, regardless of the presence or absence of these individuals. To express this in the common vernacular, let us not talk negatively behind their backs.

In Table 1, I have listed other behaviors which may be categorized as the good (helpful), the bad (unhelpful), and the ugly (punitive). Each of you can add several behaviors to these lists. I hope you will. More importantly, I hope you remember that good attitudes should be at the highest levels of your associations with each other. Greater mutual respect and admiration then will flourish, and the intimate professional bond I mentioned earlier will grow and strengthen.

In conclusion, I submit the following eight summary statements. They are meant to be thought-provoking. You may wish to add others, based upon your own experiences. 1) Ethics and value systems should be included in both teaching and research at all levels in universities. 2) According to the research of Judith P. Swazey, the following conclusions seem justified: value systems have many origins, but the most important source for graduates is supportive faculty members (role models); generic efforts to instill ethics and value systems are usually doomed to failure because of discipline uniqueness; value systems are not fixed at baccalaureate conferral but extend much later into life; a one-shot seminar keeps ethics on the fringes (the issues must be ongoing). 3) Students learn ethical behavior and value systems by interactions with role models and by informal discussion when ethical problems occur. A few subject areas for ethical discussions are sexual harassment, professional harassment, misconduct, fairness to students, ethical guidelines of funding agencies, human subjects, and animal subjects. 4) There is a tendency to achieve no higher level of ethical behavior than what may be inferred from the following statements: "As long as I do enough not to lose my license..." or "Do we really have to do that since it is not funded by the National Science Foundation or National Institutes of Health." We should do better! 5) As role models, we as faculty must never let our relationships with students go beyond mentoring. Dating or more intimate behavior between eligible parties should be avoided unless there is absolutely no current or future professional relationship likely. 6) We should show mutual respect for each other. 7) We should become more proactive in bringing ethics and value systems to our classrooms and our research laboratories. 8) We must reach our own personal decisions about what we believe to be right, permissible, or wrong. Then, we must defend those positions. Those of us in the life sciences have no better opportunity than discussion of ethical issues concerning genetic engineering.

Are we fulfilling our roles as teachers, mentors, major advisers, or role models in developing value and ethical systems in our students? My closing thought represents my charge to you. Values develop attitudes,

TABLE 1. Categorization of behaviors affecting others.

Helpful	Unhelpful	Punitive
Active listening	Selective listening	Refusing to listen
Showing understanding	Imposing meaning	Refusing to understand
Showing sympathy	Denying sympathy	Allocating blame
Exploring solutions	Imploring solutions	Refusing solutions
Seeking compromise	Limiting choices	Refusing compromise
Reducing anxiety	Ignoring anxiety	Provoking anxiety
Depersonalizing	Ignoring person	Dehumanizing
Being considerate	Being inconsiderate	Attacking
Offering help	Postponing	Never helping

attitudes develop beliefs, and beliefs develop behavior patterns. Through our actions today, we must constructively influence the behavior of future societies. It is our responsibility!

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