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Putting a positive spin on ethics teaching

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Abstract Scientific endeavor is the pursuit of knowledge with the aim of advancing the welfare of all human beings. This endeavor is built on the ideology of science; thus, society relies on the integrity of the practice of science and of scientists themselves. The responsible conduct of research (RCR) is the essence of good science; however, many of the pedagogical approaches used to instill integrity in science accentuate the negative

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rather than exemplify ideal professionalism. This paper makes an argument for the inculcation of the appropriate conduct of research via a positive approach. We address the acclimation to the culture of science that supersedes diverse cultural backgrounds of students. We suggest techniques for the implementation of positive strategies and reinforce the benefit of approaching the teaching of ethical behavior as a competitive advantage. We highlight ways in which this approach can empower the individual scientist and the scientific community as a whole. Transmission of the culture of scientific professionalism formalizes the aims of an ideal scientific professional and encourages assimilation and identification as a member of the scientific profession. We purport that instilling scientific professionalism will spur responsible conduct of research.

Keywords Responsible conduct of research (RCR) · Scientific professionalism · Scientific ethics · Ethics training

Introduction

Scientific research provides the underpinning for the progress of our society. Through inductive scientific methodology, knowledge is acquired and ultimately, universal truths are uncovered. Both the process of science and the scientists themselves must be objective and provide testable, accurate, and reproducible results. The fabric of scientific research and discovery hinges on this ideology of science and posits a trust between scientists and society. When research misconduct, research fraud, or manipulation of research for personal gain or any other selfish reason occurs, society's trust in the process and practitioners of science is shaken.

High profile cases of research misconduct and fraud have mandated a reevaluation of the scientific endeavor. To address real and potential ethical shortfalls, the National Institutes of Health (NIH) now requires formal training for their sponsored trainees in the "responsible conduct of research and the principles of scientific integrity" (Institute of Medicine 1989). Further articulation of RCR notes that "Professional development includes both technical training, such as instruction in the methods of scientific research e.g., research design, instrument use, and selection of research questions and data and socialization in basic research practices e.g., authorship practices and the sharing of research data" (Beach 1996). While consensus has been reached on the necessity of raising the ethical training bar, it remains to be seen whether the current focus on responsible conduct of research will produce ethical scientists and ethical research.

Awareness of research ethics and conduct through professional codes is central to advising scientists how to conduct themselves, to judge their conduct, and ultimately to understand research as a profession. These codes should be understood as formulae for decision-making, not as expressions of ethical reflections. As such, they should not be viewed as specific solutions to problems. In the end, this awareness evolves into the development of a professional culture worthy of embrace. Such a culture is comprised of fundamental principles and canons (Shrader-Frechette 1994) (National Academy of Sciences 2009). Fundamental principles simply describe in general terms an ideal of service. Fundamental canons lay down general duties such that one's interests as a scientist do not conflict with one's interests as a person.

Many pedagogical tools have been developed to integrate responsible conduct of research into scientific curricula in a meaningful way, but our contention is that the current focus on research integrity training has a negative connotation. Most of the teaching that has been done, albeit with a desire for positive effect, has focused on the negative impact of the lack of responsible conduct in research. Case studies and scenarios that have been developed tend toward sensationalism and exemplify unethical behavior on the part of the scientist. The focus on plagiarism, fabrication and falsification of data, or inappropriate conduct in the laboratory detracts and distracts from the transmission of expected normative practices and from the highlighting of exemplary examples of research integrity. We have termed this innate contradiction the *polarity of ethics and RCR.*

Ethical theory in science

Ethics is doing the right thing. Ethics comes from the field of applied philosophy and deals with making right and wrong decisions. Philosophers have derived ethical theories, which are systems that define right and wrong and prescribe how we ought to live. There are moral obligation theories that articulate what the right course of action is, and there are virtue theories that show what kind of person one should be. Moral obligation theories specify actions but are inadequate to change motivations. In contrast, virtue theories focus on changing the agent or the motivation but do little for right versus wrong decision making when principles conflict. In summary, ethics is considered the science of morals and the appropriate rules of conduct.

The professionalism of some disciplines is clearly aligned with highest order behavior as exemplified by medical professionalism as synonymous with the Hippocratic tradition. In contrast, initial reflection on scientific professionalism has identified what is considered substandard professional behavior rather than ideal professionalism; however, science does have an embedded ethos and standard for professionalism. We propose that a focus on acclimation to the culture of science and assimilation as a scientific professional will provide two ethical systems for scientists to exhibit professional integrity. First, learning principles for the practice of science analogous to a moral obligation theory will outline the right thing to do. Secondly, focusing on the character qualities or virtues will encourage the type of person a scientist ought to be and influence his/her subsequent actions.

The culture of science

There is an ethos of the scientific culture. The scientific endeavor has the ultimate goal to pursue knowledge that will advance human health and welfare. Embedded in this freedom of inquiry is the responsibility to act on behalf of the interests of all people and to accept responsibility for both good and bad consequences of scientific activity. Thus, engaging in scientific investigations is a privilege built on the fundamental principle of trust in the integrity of scientists and the practice of science.

The practice of science is governed by several principles: objectivity, questioning of certitude, research freedom, research reproducibility, respect for subjects, and

normalization through the greater Scientific Community (Cournand 1977) (Gilmore et al. 2016). The prima facie principle for the practice of science is objectivity, i.e. dealing with facts without distortion by personal feelings, prejudices, or interpretations. While the humanness inherent in scientific activity makes perfect objectivity impossible, scientists should strive to be objective in experimental design, analysis, and conclusions; likewise, they must acknowledge any biases and limitations in their methodologies.

Questioning certitude is the readiness to challenge the current authoritative view or dogma in order to continue the process of advancing new knowledge. Research freedom endorses novel ideas within the scientific community with the understanding that the test of time is the ultimate guardian of knowledge. Research reproducibility, another major tenet of scientific practice, mandates that scientific findings are able to be re-proven; in addition, research results must be published forthrightly so that qualified scientists can reproduce and expand the findings. Scientists also afford respect to all living things with profound respect for human life and dignity. Respect minimizes the harms and risks for research subjects and stewards limited resources to address the most pressing problems of humanity. Respect also translates into candid peer review of the scientific rationale for the purpose and justification for using subjects before experimentation begins.

The final principle is the scientific community's obligation to provide the normative processes for science through peer evaluation. With professional authority over the scientific domains of knowledge, the community bears the responsibility for the integrity of science, providing proof of the authenticity of individual findings through reproducing experimental results and contextualizing individual studies. The scientific community also assesses potential biases and conflicts of interests and frames the uncertainty of the knowledge while correcting inflation of an individual study's conclusion and discrediting fraud. Finally, the scientific community assumes the responsibility for training and accrediting future scientists.

Scientists aspire toward several virtues: duty, integrity, accountability, altruism, excellence, and respect for colleagues (Jones 2001). Scientists recognize the duty associated with their role as society's agents seeking to uncover empirical, objective knowledge or truth. A central virtue for scientists is integrity, which embodies objectivity, fairness, truthfulness and preciseness. Scientists are accountable for their scientific contributions, making public comments devoid of unsubstantiated, exaggerated or premature statements, and anticipating consequences of their explorations, both the potential benefits and harms. Scientists also aspire towards altruism, placing the interests of humanity and the uncovering of truth over self-interest, commercial interests or the promotion of the industry of science. Excellence is epitomized in the lifetime commitment towards learning and transmission of science to society and future generations of scientists. Finally, scientists respect their colleagues regardless of their level of training and credit those that contribute to their work.

The polarity of ethics and RCR

Within science, there is often a perception that ethics is merely an extension of common sense values and accepted behaviors of society, as a whole, that should have been

learned in elementary school. This naturalistic approach conjectures that people know inherently what the appropriate thing to do is and that everyone already agrees on what is right and wrong. This notion ignores the increasing pluralistic composition of the scientific community, where uniformity in ethical thinking and cultural backgrounds should not be assumed. Presupposing that appropriate behavior can be gleaned by observation overlooks the common behavior of justifying one's actions vis-à-vis the inappropriate behavior of another that has gone undisciplined. Such a hands-off policy relegates science to a minimal or least common denominator standard, rather than elevating it to a professional level. Negativity also enters into teaching ethics, when scientists are apt to murmur that regulation is a hindrance to progress; thus, teaching ethics is merely jumping through another proverbial regulatory hoop that takes away time from learning and/or applying actual scientific skills. The final sabotage is relegating the teaching of ethics as a mere side issue and not a real skill of science.

Strategies for implementing a positive focus

In the past four decades, interest in the subject of ethics has heightened; however, discussions of relevant ethical issues in the sciences have rarely devoted more than cursory attention to improving the teaching of the subject or to elevation of the subject within the institution. In most institutions, those who teach ethics may agree that the subject is viewed just as one of those subjects that students have to go through in order to satisfy certain institutional or academic requirements. As the need for teaching, the subject of ethics grows in universities and other places, so does the need for employing new pedagogical strategies. The escalating cases of misconduct that occur in institutions each day are evidence for the need to refocus the teaching of ethics as a subject. Our strategies for implementing a positive focus in the teaching of ethics include:

- Rename course to project a positive focus
- Learn from historical successes as well as historical mistakes
- Write and use case studies or scenarios with positive outcomes
- Identify and focus on exemplary role models
- Provide students with a tool box or framework for ethical decision making
- Teach students how to recognize and diffuse volatile situations.

We propose that ethics training should be elevated as a core element that is essential to doing g*ood* science. Furthermore, trainees should be inspired to become scientific professionals. This can be accomplished through development of a curriculum that includes ethics as a core element. The objectives of the ethics component of the curriculum should be to:

1) increase the diversity of students who are knowledgeable about research integrity and the related social and legal issues
2) emphasize oral, written and critical thinking competencies while focusing on the interdisciplinary connections of research integrity
3) foster assimilation and identification as a member of the scientific profession.

The first strategy would be to name the course or module using a positive emphasis. Just naming a course or module "Introduction to Research Ethics" may not be enough to attract students to the course. Examples of positive titles are *Scientific Professionalism, Fundamentals of Science,* and *The Professional Scientist*. If course content is a dry recitation of regulations, which ultimately will change, students will likely concur with some faculty that this is an exercise in futility. Institutions often designate an ethics course as compulsory in order to ensure that students attend. Rather than make the situation any better, this perpetuates the negative student attitude towards ethics. For maximum positive impact, prominent respected faculty from the science departments should be taking the lead in designing and transmitting these core values.

A second strategy is to transmit the core values and norms of a scientific professional. Emphasis should be placed on the purpose of the scientific endeavor as well as the role obligations and duties scientists hold in society. While scientists enjoy considerable freedom and financial support both in educational grants and research funding, because of the importance society places on pursing knowledge that will advance human health and welfare, we also have responsibilities. Discussions of the responsibilities of scientists as well as the freedoms need to take place. The principles of scientific practice such as objectivity, questioning certitude, research freedom, research reproducibility, respect for subjects, and normalization through the Scientific Community should be systematically taught to future generations. Emphasis of the role of scientists and the exemplary virtues that should be cultivated in scientists will exemplify the aim of young scientists.

There are many historical issues pertaining to RCR, but one might opt to use the case of Dr. Robert Gallo in pursuit of the Nobel Prize for his research to spark student interest. (Ben-Jacob 2009).While historical cases highlight ethical principles and how decisions were made in extraordinary circumstances, students will more likely be confronted with everyday ethical conflicts as well as new ethical dilemmas that cannot be answered by only understanding the past. Students need tools to exercise their own decisions and judgment instead of cases in which they are only informed about what happened during a particular event. There is increasing agreement that ethics teaching ought to focus on problem solving cases as these offer opportunities for students to practice using principles, outline their role obligations and evaluate potential consequences of their judgments. Assisting students to identify the underlying principles of ethics will naturally raise human conflict issues– the underlying problem in many ethical dilemmas. Deep understanding of the ethical principles, identifying with role obligations and evaluating likely consequences and outcomes can assist students in identifying and resolving many common ethical problems. We also accentuate the need for developing cases that exemplify obligatory behavior and positive outcomes. Teachers should also develop some everyday scenarios that assist students in recognizing the constraints within the unique work climates of scientists, and how to identify when students begin to enter a volatile situation. Scenarios help to bring case studies to life for students. Time should also be spent on strategies that enable students to diffuse and resolve conflicts.

Reinforcing ethical role models and exemplary behavior should also be apart of ethics training in science. Role models assist students to aspire to reach the status of the particular person whom they emulate and as such foster ethical behavior. In redesigning or re-conceptualizing some current ethics cases, focus should be placed on

presenting exemplary role models and problem-relevant knowledge that students need. Teachers need to identify the problems students face in their particular profession, classifying these problems in ways that reflect the basic knowledge required to deal with the problems, understanding the level of the skills used by those students, and then reconstructing cases to provide this knowledge. Ultimately, students need to be equipped with a tool box or framework that provides them with a framework for ethical decision-making.

The aforementioned strategies are generic and should be customized by the instructor to the specific area of study and the composition of the student body. One needs to present both the positive and negative aspects of ethics in a situation and map out the steps that were or were not appropriate depending on the circumstances. Working with students, the instructor can elaborate on what can be done to ameliorate difficult conditions and what the potential consequence are. Depending on the focus, topics such as censorship by government influence, bias from the perspectives of gender, culture and ethnicity, data misrepresentation, data sharing, financial management, scientific collaboration, responsible authorship, mentor/trainee relationships, responsibility to society, and behavioral factors are some examples of what might be covered. The students can research case studies that exemplify specific points or can create their own scenarios in addition to the material provided by the instructor. The educational material is widely available (Kalichman 2013). Education, culture and society, and role modeling are all significant components of developing positive perspectives in RCR The overall goal of the instructor is to set the moral compass for the students. This exemplifies the importance of role models in ethics education. The purpose is to expose students to appropriate outlooks, behaviors, and professionalism (National Institute of Health. (NIH) 2017).

Good teaching is not something that always occurs naturally, but is a skill that has to be learned and requires some serious commitment on the part of the teacher in terms of both effort and time. A similar commitment must be made by institutions and at the national level by funding and rewarding faculty efforts in these areas. By trying and practicing different approaches and styles, one develops good teaching skills: learning how to integrate various teaching options such as lectures and discussions in ways that encourage ethical thinking among students (Ben-Jacob 2004). Teachers also need to be innovative in the use of alternative teaching strategies such as the use of fictional literature, films, computers and theatre and need to think of other media they can use to ensure that the subject as well as their teaching remains attractive and engages students in the learning process.

Conclusion: Ethical behavior as empowerment

The necessity of training skilled ethics teachers for science cannot be underestimated. While ethical theory and philosophy are the underpinnings of ethics, ethical training for scientists must focus on practical relevance to the specific ethical issues and dilemmas of science and scientists and teaching skills for ethical decision. The essentials of research integrity and RCR should begin early in the higher education of all students and continued in graduate and postdoctoral training. A positive training environment is integral to promote integrity. The National Institute of Health (2017) which funds

projects on RCR and research integrity supports this initiative among numerous others. The overarching goal is to improve the understanding of the fundamentals of research integrity by linking field and laboratory work.

Increasingly, doing scientific research has become a highly cooperative activity involving extensive interactions among individuals from diverse educational and cultural backgrounds, working as a part of a team, either in a laboratory or a population research setting. This model of collaborative research is likely to only increase with the emphasis in the NIH roadmap on collaborative and cross-disciplinary research. As a result of an emphasis on team building, the ability to achieve and maintain high morale among members of the both the immediate unit and the larger department plays a significant role in scientific success and productivity. The role of morale in scientific achievement is often not discussed explicitly; however, when examples of successful scientific environments are discussed, high morale and productive collaboration are central to the success.

We advocate that ethical behavior with respect to exemplifying scientific professionalism and responsible conduct in research is essential for creating and maintaining this positive environment. Working with another professional has at its crux trust that a colleague will do the right thing, with honest, responsible work and accurately credit everyone who contributed to the work. This in turn fosters collegiality and the ability to communicate openly with colleagues when differences of opinion arise about the conduct or interpretation of research. This positive element in the research environment radiates into areas beyond the direct conduct of research. It becomes easier to recruit new investigators to a group where individuals are happy and productive because they all subscribe to a similar code of ethical behavior. Furthermore, free exchange of ideas can occur when one is not worried about misappropriation of credit. This collegiality also promotes networking in a larger community extending beyond the immediate lab or program.

A positive environment with respect to ethical behavior avoids the negative financial, emotional, and productivity consequences of having to deal with unethical behavior or be tainted by association with misconduct of a co-worker. These negative consequences can destroy the productivity of a research group, at least for a time. In addition, the enormous damage done to the reputation of a group or institution as the result of unethical behavior can linger in the minds of colleagues long after the matter has been addressed at the institutional level and even affect later employment, funding and review of research. Exemplifying good ethical behavior, on the other hand, may provide a sense of empowerment, where colleagues trust and respect each other's scientific contributions and fosters greater professional development.

The long-range goal of teaching ethics to scientists should be not only to promote integrity in research but also to educate students in the process of making decisions that will lead to responsible and appropriate actions with regard to their research in their present and future academic and professional lives. A high standard of scientific professionalism should be the ethical inheritance for future generations of scientists.

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Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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