Embedded Discourse: Lab-Based Conversations about Ethical Practice
Dena Plemmons, Research Ethics Education Program, University of California Riverside, USA

Supplemental Materials:
PNAS Supplemental Material

We developed a project-based and lab delivered research ethics curriculum [entitled Institutional Re-engineering of Ethical Discourse in STEM, or iREDS] that was designed to enhance the ability of science and engineering research laboratory members to engage in the kind of interpersonal communication that is necessary for ethical practice. This approach represents a paradigm shift compared with more typical module-based or classroom ethics instruction that is divorced from the everyday workflow and practices
within laboratories; it was designed to cultivate and support a campus culture of ethical science and engineering research in the very work settings where laboratory members interact.

The iREDS training was designed to be integrated into existing/ongoing projects and the everyday practices of the laboratory/research group. This approach combines online data management and collaboration technology [a free, open-source, web-based collaboration tool, the Open Science Framework (OSF; https://osf.io/), that is maintained by the Center for Open Science] with project-based and peer-involved conversations that demonstrate the value of effective communication in practice. The training encourages laboratory members to become comfortable with the norms and skills of how best to talk to each other about the ethical dimensions of their practices and to reflect on norms of practice that operate within the laboratory and within the larger discipline.

Most existing approaches to ethics training are not tailored to enhance the interpersonal skills and capacity of laboratory members to engage in the kind of reasoned communication that is necessary for putting ethical knowledge into practice. Ethical practice is enhanced when training is connected to conversations within the laboratory setting on specific research projects and when ethical discourse governing scientific acts is routinized into the workflow of the laboratory. This approach reinforces the sense that “knowing” and “doing” are inextricable for the practice of ethical research.

This intervention was further motivated by the core normative principles of deliberation within social communication, which envisions an ideal of reasoned, uncoerced, and transparent argumentation for and against decisions that are ideally arrived at collectively. To advance this deliberative ideal, our training did not didactically instruct individuals on what is or is not ethical; rather, the training proceeded as a decentered discussion among laboratory participants – including the PI – on how each might best understand the ethical implications or dimensions of the practices that occur within the laboratory.

The results of our randomized control trial, with iREDS as the intervention, implemented among science and engineering laboratories in two research-intensive institutions demonstrated that, compared with the control laboratories, intervention laboratory members perceived improvements in the quality of discourse on research ethics within their laboratories as well as enhanced awareness of the relevance and reasons for that discourse for their work as measured in surveys administered 4 months after the intervention.

The training met its goals of fostering a better climate and deliberative communication within the participating laboratories when compared with the control condition.
Towards a Neuroethical Ethos: A Case Study in Reframing Neuroethics Education for Engineers and Researchers

Juhi Farooqui, Rehab Neural Engineering Labs, Carnegie Mellon University, USA
Sarah Dawod, University of Pittsburgh, USA
Devapratim Sarma, PhD, Carnegie Mellon University, University of Pittsburgh, USA
Josep-Maria Balaguer, University of Pittsburgh

Neurotechnology and neural engineering are rapidly advancing fields. With this advancement, a host of ethical considerations emerge, both classic and novel. At the University of Pittsburgh’s Rehab Neural Engineering Labs (RNEL) we work to integrate these considerations into the scientific culture by cultivating a neuroethical ethos - as a research culture wherein neuroethics is woven into the fabric of how researchers do research—where scientists address the ethical considerations of their work at every stage, from ideation through experimentation to communication of results in academic forums and onward to engagement with end-users and the public.

Over the past year we have developed a dialogue-based approach encourages internally driven development of a neuroethical ethos, manifesting from the insights that emerge from a regular practice of engaging with neuroethical issues in community. It allows researchers to enhance their knowledge of and ability to reason about ethical principles on their own terms, thereby fostering consideration of ethical principles throughout the lifecycle of research projects.

Our preliminary efforts show that these discussions challenge researchers’ preconceptions of ethical principles and support them in developing a stronger sense for how their values interact with their research. This moves us toward our goal of developing a lab-wide research ethos that encourages researchers to continuously, openly, and deeply engage ethical principles throughout their work.

A Bottom-Up Approach to Building a Culture of Responsible Research and Practice in STEM

Elisabeth Hildt, Center for the Study of Ethics in the Professions, Illinois Institute of Technology, USA
Kelly Laas, Center for the Study of Ethics in the Professions, Illinois Institute of Technology, USA
Chris Miller, Savannah College of Art and Design, USA
Eric M. Brey, Department of Biomedical Engineering, University of Texas, San Antonio, USA
Laura Gaviria, Department of Biomedical Engineering, University of Texas, San Antonio, USA
Francisca Acosta, Department of Biomedical Engineering, University of Texas, San Antonio, USA

Supplemental Material:
Draft Workshop Module
Slide Deck

The presentation will showcase the results of a project that aims to improve the ethical culture of STEM research labs by moving responsible conduct of research education from the classroom into research labs. Based on the presenters’ leading this workshop,
we will present various versions of the RCR/ethics workshop module developed that aim to improve the ethical culture of research labs and that can be used by universities, departments, and research groups nationwide.

The project is based on graduate students developing lab or department-specific guidelines to be discussed and potentially be adopted by labs or departments that could be helpful in dealing with potential future RCR-related ethical issues. During graduate student ethics workshops, graduate students discussed ethical issues they had encountered in their research and, based on an analysis of existing ethics codes, developed their own context- and lab-specific guidelines that serve as a starting point to discuss and hopefully improve the department's ethical culture. The approach clearly improved the graduate students' awareness of ethical issues related to lab culture and responsible conduct of research and facilitated a department-wide discussion process. A draft module of the workshop series will also be made available.

**Building Connections Using Culturally Relevant Practices in STEM Departments**
Karina Vielma, Department of Biomedical Engineering, University of Texas at San Antonio, USA

Many students traditionally underrepresented in STEM fields often feel the need to assimilate or repress their identities in order to succeed in their college majors. Others who successfully complete their STEM degrees leave the workforce for an occupation in a field that is more welcoming of their identities and cultures. College STEM departments can make a lasting impact for all students by using culturally relevant practices in their courses, mentoring, research, and professional and personal development. This presentation will begin with a model for culturally relevant practices and will provide examples of what these practices may look like in a STEM department.

**Discussion**

*Break 1:30-1:45 PM, CST*

**Session 2**
1:45-3:15 PM, CST
Chair: Eric Brey

**Publisher: Springer Humanities Books**
Christopher Wilby, Springer Publishing, Netherlands
Floor Oosting, Springer Publishing, Netherlands

Editors from Springer will share opportunities to publish work in the area of ethics education, as well as information about the collected volume emanating from the work being shared in this workshop.
What Does it Mean to Embed Ethics in Data Science? An Integrative Approach Based on Microethics and Virtues

Emanuele Ratti, Institute of Philosophy and Scientific Method, Johannes Kepler University Linz, Austria

In the past few years, scholars have been questioning whether the current approach in data ethics based on high-level case studies and general principles is effective. Some have been complaining that such an approach to ethics is difficult to be applied and to be taught in the context of data science. In response to these concerns, there have been discussions about how ethics should be “embedded” in the practice of data science, in the sense of showing how ethical issues emerge in small technical choices made by data scientists in their day-to-day activities, and how such an approach can be used to teach data ethics. However, a precise description of how such proposals have to be theoretically conceived and could be operationalized has been lacking.

In this talk, we propose a full-fledged characterization of ‘embedding’ ethics, and how this can be applied especially to the problem of teaching data science ethics. Using the emerging model of ‘microethics’, we propose a way of teaching daily responsibility in digital activities that is connected to (and draws from) the higher-level ethical challenges discussed in digital/data ethics. We ground this microethical approach into a virtue theory framework, by stressing that the goal of a microethics is to foster the cultivation of moral virtues. After delineating this approach in more theoretical details, we discuss a concrete example of how such a ‘micro-virtue ethics’ approach could be practically taught to data science students. In particular, we describe how this method has been applied to teach data ethics to students participating in the CODATA-RDA Data Science Summer Schools, and how we plan to develop it further in the future.

Embedding Moral Reasoning and Teamwork Training in Computer Science and Electrical Engineering

Alan P. Sprague, Department of Electrical & Computing Engineering, University of Alabama at Birmingham, USA
Raquel Diaz-Sprague, Department of Electrical & Computing Engineering, University of Alabama at Birmingham, USA

Supplemental Materials:
Ethics in Action Challenge for Students
Slide Deck

The Accreditation Board for Engineering & Technology (ABET) mandates that both ethics and teamwork training be course objectives in at least a course in the Computer Science (CS) and Engineering curriculum. After observing a high rate of teamwork failure in a CS Capstone course in fall 2016, the authors conducted extensive post-mortem interviews with team members and uncovered a variety of unhelpful, unproductive attitudes and behaviors, including social media posts among team members which ultimately led to teamwork failures. Responsibility, respect for all persons, collaboration, fairness, and reciprocity are considered important aspects of a college education and employers deem them essential for success in the workplace, however, these topics are difficult to teach by regular STEM faculty. negative impact.
At the University of Alabama at Birmingham (UAB), the authors are pilot testing a modest, integrative approach - a 4-class period minimodule, covering both ethics and teamwork - embedded in upper level CS and ECE courses. The minimodule includes a short refresher on moral reasoning, collaborative behaviors, and teamwork training. Using an andragogical approach, we guide discussions by student teams after viewing video lectures by renowned experts. Outside of class, students read teamwork articles and work on preparing teamwork demonstrations by student teams to the class. We find that this andragogical approach - discussions instead of lectures - and student-led demonstrations has resulted in active collaborative learning, good interpersonal relations and zero teamwork failures. It can, therefore, be suggested as a "best practice."

In addition, we report on the ongoing Ethics in Action Art or App Contest at the UAB Electrical & Computing Engineering Department. It provides incentives for students to develop beneficent software and moral guidance tools: “software engineering for the soul.”

**DigEsT: How Ethicists can Spearhead Digital Ethics Education in a Computing Department**

Marc Cheong, School of Computing and Information Systems (CIS) / Centre for AI and Digital Ethics (CAIDE), University of Melbourne, Australia
Kobi Leins, School of Computing and Information Systems (CIS) / Centre for AI and Digital Ethics (CAIDE), University of Melbourne, Australia
Simon Coghlan, School of Computing and Information Systems (CIS) / Centre for AI and Digital Ethics (CAIDE), University of Melbourne, Australia

In the field of computing, the need for the inculcation of ethics through the entire tertiary education ‘pipeline’ - from undergraduate students to tenured members of faculty - has been increasing in the past few years. Various initiatives across the spectrum have spearheaded this: from the increased attention on the codes of ethics of professional organizations (such as the ACM or IEEE); to the establishment of research groups specializing in digital ethics; to the rapid growth of conferences and workshops in computing and ethics, such as Fairness, Accountability, and Transparency (ACM FAccT).

In this paper, we would like to focus on how we spearheaded ethics education in the Centre for AI and Digital Ethics (CAIDE) by creating DigEsT -- the Digital Ethics Teaching hub -- which provides a low-friction way to inculcate ethics teaching in their units, as well as to get the conversation started for instructor teams. Our DigEsT initiative is a growing library of video lectures, in the form of panel discussions, which can be readily used by lecturers and instructors, in a diverse range of subfields in computing. Our innovation lies in a triple-discipline approach, drawing on the strengths of each of our team members -- from computing, philosophy, and law -- providing a non-dogmatic, holistic, approach to ethics education, while remaining relevant and on point to specific computing subfields.

Our paper will cover the best practices within deploying such a learning resource on a department-wide basis, including technological logistics, how to address common needs by students and faculty members alike in their pedagogy, and more importantly how we rapidly adapted to asynchronous learning modes (brought on by the COVID-19 pandemic).
In Summer 2017-2019, faculty in philosophy and in biology at Occidental developed a collaboration centered on a two-week fieldwork experience at the Organization for Tropical Studies’ La Selva Biological Research Station in Costa Rica. The collaboration had two primary components: (1) a philosophical reading, journaling, and discussion group for both philosophers and ecologists, focused on ecological research ethics, and (2) philosophy faculty and undergraduate researchers embedded within, and assisting with, ecological fieldwork.

Participants over the two years included: eleven undergraduate ecology students, two undergraduate philosophy students, three faculty members in ecology, and one faculty member in philosophy. Initial assessment of the collaboration suggests the potential for a long-lasting impact both on how ecology students understand and approach their research, and on how philosophy students understand the relevance to their studies of engaging deeply in the social practices about which they think and write. As one ecology student wrote: “I think making students consider why they value nature and science really changes the way that you do your work.”

This presentation will: (1) describe the collaboration, including detailed descriptions of the journal prompts and the whole-group discussions; (2) present initial assessment data from the pilot, as well as the changes made in the second and third years in light of feedback; and (3) reflect on the challenges and opportunities of integrating philosophy and fieldwork, and of maintaining, translating, and “scaling up” this kind of collaboration.
While education in ethics and the culpable conduct of research is generally accepted as an indispensable component of graduate education, principally in the STEM disciplines (science, technology, engineering, and math), little harmony exists on how best to pull off this objective. Access to STEM education is a social justice issue that goes far beyond the latest pedagogical trends or trinkets. In this research paper, we are going to show how Institutes under UBA, create a sense of responsibility to leverage the power of STEM to alleviate disparities in our communities and beyond, which would likely to result in an era of peace and human progress by developing ethics in STEM.

Unnat Bharat Abhiyan (UBA), a flagship program of the Ministry of Education, Govt of India as movement for progressive India, is tackling the issue at both levels of education, schools, and colleges. UBA has emerged as a source of influencer by being associated with 2614 Higher education Institutions, 14000 plus villages, with more than 100000 students of technical and Non-Tech colleges participating actively. UBA teaches the volunteers how to practice their knowledge onto the ground and to give back to society what they have earned in due course of their education. In this way, UBA inculcates the feeling inside a student to use STEM knowledge on generating livelihood or contributing to make villages self-reliant. Secondly, this paper also covers how UBA reaches village kids at schools’ level by interlacing science and maths beyond the classroom, creating STEM kits, and integrating values into it, by converting the way of learning at the primary level.

Race Matters as a Matter of Ethics in Engineering and Technology: Reflections on exclusivity in device design
Rosalyn Berne, Department of Engineering and Society, University of Virginia, USA

That racial exclusivity can be designed into an engineered device is perhaps morally baffling. Yet there are examples to suggest this indeed seems to have occurred; the pulse oximeter serves as a timely case in point. How does this happen or, perhaps more importantly, what needs to happen within STEM culture to be sure it doesn’t happen again?

Building Inclusive Cultures through Community Research
Jennifer Nyland, Department of Biological Sciences, Salisbury University, USA
Timothy Stock, Department of Philosophy, Salisbury University, USA
Michéle Schlehofer, Department of Psychology, Salisbury University, USA

Supplemental Material:
Case: When to Vaccinate, When to Educate
REACH Handout

The R.E.A.C.H. Initiative is a multi-year collaboration between the departments of Philosophy and Psychology at Salisbury University. The humanities are at the center of a needful rethinking of the purpose of undergraduate education at our institution, as well as the public mission of state-assisted universities. The R.E.A.C.H. Initiative brings together, via a slate of new curricular and co-curricular resources focused on Ethics, two major elements of institutional revision: (i) Curriculum change aimed at harmonizing professional training with early exposure to philosophical and research ethics, and (ii) Community-driven learning, where our immediate community has a say and a stake in the design of public-facing services, internships, and programming.
“Listening First: Methods and Outcomes in Community-Based Descriptive Ethics”
This presentation will present a primer on applying Community Based Research to Descriptive Ethics. This approach, dubbed “listening first”, allows the immediate community surrounding Salisbury University to have a say in determining the most pressing priorities of ethical concern. The methodology entails conducting regular listening sessions with representatives of large and small non-profits, government leaders, community activists, and leaders of for-profit enterprises. In the listening sessions, a series of questions about ethics are posed for attendees to discuss. The outcomes of this research are coded and outcomes are echoed back to the community at the same time they are integrated in discussions of curriculum on SU’s campus.

“What should matter in the classroom? Building Sustainable Ethics Across the Curriculum.”
This presentation will specify the methods for distributing REACH listening session content across SU’s faculty to identify opportunities for ethics to have a newly envisioned role in courses, curricula, and programs. The outcomes of this program are discussed from the perspective of faculty development and curriculum reform, and as a way to understand inter-curricular dependencies.

“Hands on the Big Picture: The Biology Laboratory as an Ethics Incubator”
This presentation will provide a concrete example of a specific implementation of Ethics Across the Curriculum in the Biology classroom. The goals of this implementation are to include space in the lab experience for discussions of REACH ethics resources for the sake of enculturating an interest in building technologies that are intentionally pro-social and ethically informed in their design. The laboratory context can introduce these discussions from hands-on experiences. Case-based materials can be used to add context for what technologies should include as an articulation of their public benefit, and use technology as an application of an ethics framework for considering the “real world” macro-level picture of science as a social enterprise.

Discussion

Break 10:30-10:45 AM, CST

Session 4
10:45-12:15 PM, CST
Chair: Kelly Laas

Inclusivity in the Education of Scientific Imagination
Mike Stuart, Center for Philosophy of Science, University of Geneva, University of Tuebingen, Switzerland/Germany
Hannah Sargent, PhD, Science, School of Physical Sciences, Open University, U.K.

Supplemental Material:
Slide Deck

Scientists imagine constantly. They do this in order to come up with new research problems, design experiments, interpret data, troubleshoot, draft papers and presentations, and give feedback to each other. In four years of ethnographic research, I have found that advanced career scientists feel very comfortable using and discussing
imagination, while graduate and undergraduate students of science often do not. This is especially true for students of minority backgrounds of any kind (gender, ability, race, etc.). Many of these students express quite negative views about the possibility of using imagination in their daily work. This is because they feel pressure to come across as a “legitimate” and “serious” scientist. In this talk, I will argue that this is an undesirable state of affairs. One might think the damage done by dulling enthusiasm for imagination in vulnerable groups of scientists is exceeded by the good it does: established scientists should be the ones imagining new research problems and methods because they have the best scientific intuitions. But even if this were true, there would be no reason for it to disproportionately affect certain groups, especially groups that are already disadvantaged. Secondly, science is done best when different perspectives are brought to bear on each problem. Reducing the number (or volume) of different voices is counterproductive because while humans cannot avoid having some biases, our biases are best identified by people with different sets of biases. Inclusive science should represent the full spectrum of human interests, which is best attempted by enabling and employing a broad spectrum of human scientists, which current science education may be thwarting by pushing imaginative students of minority backgrounds away. To face this problem, I explore some of the ways that current undergraduate education de-emphasizes the use of imagination in science, and discuss how exemplar-based learning can be used to counter worrying anti-imagination trends.

Using a Brain Processes Map as a Framework to Strengthen Ethical Culture in Research Labs

J. Brooke Hamilton, EthicsOps.com, University of Louisiana at Lafayette, USA

Supplemental Materials:
Noggin Brain Process Map
Noggin Slide Deck

Giving a research team a map of the processes their brains use to recognize ethical issues, judge what is right and wrong, choose how to act, and confirm or improve their ethics processes, enables them to recognize these processes in their own experiences and to do those processes more effectively. Mapping the processes gives team members a common language of ideas and terminology to think and talk confidently about ethics in their lab. This language is designed to be easily remembered and to fit comfortably into their work conversations. The map also highlights shared criteria to verify their own ethics judgments and resolve disagreements with others. Team members can understand not only what is right or wrong but how and why they and others in their lab judged and acted the way they did.

The map I will discuss includes and moves beyond the proven process, stressed in most ethics instruction, of Using my Head to make slow/deliberate rational judgments using ethics tests grounded in character, on duties to self, colleagues, and humankind, and on best outcomes. The map also emphasizes the slow/deliberate processes of Engaging the Crowd by discussing with or consciously imitating respected others. It shows the importance of quick/automatic Trust my Gut processes, including intuitive judgments, unconscious imitation of others, and reaction to criticism and threats. And it shows the important role of emotions, including certainty, as motivations to act.

My presentation will employ an experience-focused model of brain processes that is my synthesis of behavioral and neuroscience research and of ethical traditions in philosophy.
and religions. After briefly introducing the map and sharing some of the illustrations and materials a lab team can use to learn its language, I would engage participants in a discussion of how much time they can devote and what material formats they would want to use to make it a part of their lab’s culture, and what follow-up exercises they would want to encourage ethics discussion as part of their lab’s culture. To date our team has developed video and brief graphic-novel style explanations, text and image-based online learning modules, foldout checklists, illustrated case examples, poster appropriate images, and a website that introduces ethics tests translated into easily used language and applied to several cases. I hope that eliciting comments on our brain processes map approach, and listening to the other workshop sessions, we can develop materials specific to use in individual labs.

Storytelling as a Facilitation Tool for Inclusive Ethics Training
Marietjie Botes, IRiSC Sociotechnical Cybersecurity Interdisciplinary Research Group, SnT - Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg, Luxembourg

Supplemental Material:
Slide Deck

Storytelling is an ancient form of communication that, in the context of science, helps listeners understand the essence of complex concepts and ideas in meaningful and often personal ways, and can enhance inclusivity by exploring the deeper dimension to communication with our students and colleagues. This tool can effectively engage students and faculty working in research labs and improve the ways in which they engage in science and expand who engages in science. Storytelling can make science more understandable, more inclusive, and appeals to both the heart and mind by powerfully communicating the ethics lessons that emerged throughout history. People identify with the characters and respond to the narrative in stories, especially when there is emotional detail and remember information given in story form much more vividly. In a research setting, stories can serve as an entry point to understanding the world of others in a different way, which in turn may affect the connection between researchers and research participants and the legality and ethicality of informed consent. In this context a story can convey important information much better than mere facts and figures, which often are intimidating.

Ethics training should not only accompany scientific training to ensure that scientists conduct ethical research but should also train scientists to be better communicators to the public and advocates for the advancement of science. Storytelling, as a form of science communication, has the potential to overcome the barriers that complex scientific terminology, processes and uncertainty poses to public trust and cooperation. Recent research has shown that rule-based moral philosophy, psychology, and education cannot effectively promote students’ moral motivation for actual moral behaviour, but argued that virtue ethics and positive psychology can contribute to the effective promotion of motivation for self-improvement by connecting the notion of morality. Storytelling can be used as a facilitating tool for the development of such virtue ethics and empathy to improve ethical insight and approaches to science and research.

This presentation will present the art and science of storytelling as a two-way trust and relationship building tool which enhance empathic understanding of ethics to ensure that ethics are adequately integrated and embedded in scientific training and research, whilst
actively engaging students, faculty and even research participants by building inclusive ethical cultures. This tool can also be adapted to help international or underrepresented students to gain insight into cultural differences and its effect of ethical approaches.

Discussion

Lunch Break 12:15-1:00 PM, CST

Session 5 1:00 pm-2:30 PM, CST
Chair: Chris Miller

Encouraging Transparency in Lab Safety via Teachable Moments and Positive Feedback
Melinda Box, Department of Chemistry, North Carolina State University, USA
Maria Gallardo Williams, Department of Chemistry, North Carolina State University, USA

Supplemental Material:
Lab Safety Handout
Lab Safety Slide Deck

Transparency is an essential part of developing and maintaining an ethical culture and a safety culture. We found two practices that significantly contributed to both - capitalizing on teachable moments and the active provision of detailed positive feedback. When we applied these to instances of evaluating performance, we found that they facilitated communication and supported the inquiry necessary to develop and sustain openness. While enforcement, an alternative approach, may evoke rapid compliance, it may also tend to reduce discussion. By contrast, we found that consideration of the vulnerability of those in non-compliance tended to ease the exchange and support the robust relations needed to create and maintain safe conditions. Appreciation for the state of intense interest and hunger for information characteristic of these teachable moments led to providing specific guidance that recipients were ready to use immediately. In addition, reinforcement of existing desirable practice via specific positive comments gave recipients the guidance necessary to build on their current foundation of skills, knowledge, and strengths. This presentation brings together research in neurological science, principles of management and evaluation, and cases of our observation to illustrate how performance evaluations can be leveraged to achieve an ethically responsive culture.

Developing an Ethics Credential for Undergraduate STEM Majors
Alexandra Bradner, Department of Philosophy, Kenyon College, USA
Rebecca A. Bates, Department of Integrated Engineering, Minnesota State University, Mankato, USA

QALY (Quality-adjusted Life years) Module for STEM Faculty Integrating Bioethics Content Into Their Courses

Slide Deck
Scientists, programmers, engineers, and mathematicians must be able to assess the impact that their work will have on the society in which they live, and they must be able to communicate their work to the general public. For these reasons, faculty are encouraged to incorporate ethical, social, and historical content into their undergraduate STEM courses. But this is challenging, as there is usually more than enough foundational material to fill out the syllabus. Moreover, adding interdisciplinary content to one’s courses can involve a steep learning curve.

As part of the NSF-funded, Fall 2020 STEM Futures Education Project (https://serc.carleton.edu/stemfutures/about.html), we developed a collection of 1-2-day ethics modules that STEM faculty can incorporate easily into their courses. There are three categories of content and several modules in each category: 1) conducting research responsibly; 2) the philosophy, history, and sociology of STEM; and 3) personal decision-making for people with STEM careers. By picking and choosing among the modules and establishing some basic requirements, a STEM department can craft an ethics credential that suits its own learning outcomes. We believe that STEM faculty will offer higher stakes assignments once they feel confident in their mastery of the new humanities material and in their ability to fairly grade humanities papers. Once students realize that they can only succeed in their STEM courses if they can think and write critically about the broader social contexts in which the STEM disciplines are practiced, they fully engage.

Social Responsibility Development in Undergraduate STEM Students: Influences and Inhibitors
Daniel Schiff, School of Public Policy, Georgia Institute of Technology, USA
Jason Borenstein, Graduate Research Ethics Programs, Georgia Institute of Technology, USA
Ellen Zegura, School of Computer Science, Georgia Institute of Technology, USA

Supplemental Materials:

Generalized Professional Responsibility Assessment Tool

Educators recognize the critical need to help students develop social responsibility attitudes and skills. Concerns about (the lack of) ethical practice during research and other activities are especially salient in the STEM fields, which is highlighted by recent public incidents and scandals (Grigg, 2017; Mansouri, 2016). Yet making sense of the cause of ethical lapses or misconduct requires understanding the broader context under which STEM students develop their attitudes, including pre-college beliefs, parental influences, coursework, peers, internships, and participation in community engagement. In combination, these, and other influences (or barriers) impact students’ awareness, ability, and sense of obligation, especially with regard to the public and its well-being.

In this presentation, we share findings from a five-year mixed methods study of how undergraduate students develop both personal and professional social responsibility attitudes. The quantitative portion of our study involves the administration of the [tool name] to undergraduate students to measure their social responsibility attitudes and influences (citation removed). The survey, adapted from the Engineering Professional
Responsibility Assessment (Canney & Bielefeldt, 2016) was administered to four graduating classes at a public four-year college focused on technology, and has additionally been administered to the study’s primary cohort of students at two time points to track their development over time. The qualitative portion of the study involves interviews with 21 undergraduates from the primary cohort during their second year of college, and considers a wide range of experience that shape student attitudes. In conjunction, this research sheds light on how students develop – or fail to develop – personal and professional social responsibility attitudes. These influences and inhibitors in undergraduate education are likely to shape how students understand and practice ethics in laboratory settings.

During the session, we will share these and other quantitative and qualitative findings, explore differences across student subgroups, and consider possible approaches to mitigate negative influences and leverage positive ones. Our study is still ongoing. Yet, by broadly examining student social responsibility development, we are in a better position to understand the positive and negative influences students face that may otherwise remain invisible.

Discussion

Closing Remarks and Next Steps