



SUMMER 2020

Infusing Ethics in Research Groups: A Bottom-Up, Context-Specific Approach

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ABSTRACT

This article describes a National Science Foundation-funded project that engages graduate students in the active development of context-specific codes-of-ethics based guidelines for use in their research group. By actively engaging students in ethics discussions specific to their everyday practice, this approach has the benefit of situating ethics education within the research environment where ethical issues often arise. This approach has the potential to empower participants by helping them become aware of the rules and often unacknowledged norms that exist in research groups. The guideline development process facilitates discussions between Principal Investigators and trainees about these crucial issues. The topics addressed in the guidelines include authorship, lab dynamics, mentoring relationships, peer relationships, and issues of inclusion. The project also highlights significant differences between faculty and graduate students in what ethical issues they consider most important in the research environment. While faculty tended to concentrate on more traditional responsible conduct of research issues such as data management, complying with regulations for animal and human use in research and authorship students focused on the topics of power dynamics,



relationships in the labs, and issues faced by international students and other marginalized groups. The guidelines developed offer both a reflection of the current ethical culture within the research environment and give students a voice addressing these perceived issues. The iterative process of revising these guidelines engages stakeholders at the university, including students, faculty, and administrators to participate in ongoing discussion and reflection on issues of research ethics in a way that may facilitate real change from research groups up to the department and college level.

Key words: Research ethics, Experimental learning, Workplace culture

INTRODUCTION

This article describes a National Science Foundation-funded project that situates ethics education within the research environment by actively engaging graduate students in the development of context-specific codes-of-ethics based guidelines.¹ We describe a process for facilitating students in the development of the guidelines that involve a series of graduate student workshops designed to help participants identify and discuss ethical issues they have experienced or seen in their research careers. In this, the students develop a draft set of guidelines designed to address the specific issues they have identified. These guidelines then go through an iterative revision process where faculty and other stakeholders have the opportunity to comment and suggest revisions to the guidelines with the goal of either adopting them or using the suggestions and discussions as a catalyst to improve the ethical culture of research.

APPROACH

In the 2017 workshop “Overcoming Challenges to Infusing Ethics into the Development of Engineers,” three main challenges were outlined (NAE 2017, 9). First, the need to make engineering ethics relevant to students both in their education and throughout their careers, second, to help

¹ In the workshops led at Illinois Tech, students were asked to look at professional codes of ethics and guidelines emanating from academic research groups, industry standards could also be a rich source of information depending on the discipline and research context the students are engaged in. This approach was partially inspired by the Group Policies section of Kalichman MW, Plemmons D. Research Ethics Workshop: Promoting Ethics in Research. Richmond; available at <http://www.onlineethics.org/File.aspx?id=34264&v=3b1a9266> (last accessed 22 Oct 2018).



build faculty capacity for teaching ethics, and third to enable institutional change. This project's approach seeks to address these challenges in the following ways.

Approaches to ethics education in engineering have gone through a massive shift in the last few years. In meta-analyses of ethics education, some of the most successful methods include engaging a multidisciplinary expert teaching team, involving students in active case-study discussions of scenarios that reflect real-life scenarios, and including activities that ask students to individually practice and actively engage with the material at hand (Mulhearn 2017, Mumford 2015, Watts 2017). While these approaches work in classroom settings, time constraints and the hesitation of some faculty who feel they lack the expertise to teach ethics are often impediments to the effective integration of ethical concepts into technical courses (Canney et al. 2017, Freyne et al. 2010; Walczak et al. 2010).

One way to alleviate these roadblocks is to find new settings to integrate ethics, such as the research environment. During the "Overcoming Challenges" workshop, presenter Dr. Erin Cech noted that it is crucial to incorporate ethical considerations into what often are purely technical spaces (NAE 2017, 9). Influence on a student's awareness of ethical issues occurs not only in the classroom but also across a wide range of experiences within the institutional context. This contextual learning can be vital for not only helping students develop their ethical knowledge and skills but also in changing the attitudes and beliefs of students (Kalichman 2015; Peiffer 2008).

The approach described seeks to integrate ethics education in research groups (i.e., technical spaces), in that it facilitates discussions among graduate students about ethical issues in research labs. The project team worked with faculty from four different departments at their home university to recruit students to take part in the Student Ethics Committees. Participants took part in a series of six two-hour meetings (further described in the following section) and developed a set of guidelines based on their own experiences. Students participated in active learning sessions (involving discussions of fictional and real-life cases, minute analysis of existing professional codes of ethics, institutional policies, and other guidelines) and worked collaboratively to craft the discipline-specific guidelines.²

One of the significant challenges discussed in the 2017 workshop mentioned above was how to make ethics education more relevant to students. There are differences between what students and

² The project team has also published a recent article that fully describes the education approach of this project. Hildt, Elisabeth, Kelly Laas, Christine Miller, Stephanie Taylor and Eric M. Brey. (2019). "Empowering Graduate Students to Address Ethics in Research Environments." *Cambridge Quarterly of Healthcare Ethics*. 28:542-550. See also, Narvaez, D. Integrative Ethical Education." In *Handbook of Moral Development*. Killen, Melanie and Judit G. Smethana (eds.) New York, Psychology Press Taylor and Francis Group.



faculty perceive about what kind of information is essential to deliver in ethics education (Holsapple et al. 2012), and in most cases, the faculty perception prevails. In our bottom-up approach, graduate students think about, articulate, and discuss the ethical issues they encounter and the ways they hope to achieve change and improve an ethical culture. This is opposed to a top-down approach often encountered in guidelines developed by Principal Investigators (PI)s³ and official policies or codes of ethics developed by institutions or professional organizations. In only rare cases do student voices get heard in the drafting of these guidelines, though students are often the primary stakeholders influenced by these normative documents. In the workshops, when students were asked to review these guidelines, they became aware of prevailing policies, regulations, and guidelines that govern research, critically examined how well these existing systems work and made suggestions about how they could be changed to better reinforce ethical cultures in research.

The bottom-up development of guidelines offers a unique opportunity to engage all members in the research environment in discussions about the ethical culture of research groups and offers at least a partial solution to the second challenge raised, working to develop faculty capacity for teaching ethics. This approach opens a new space for this kind of knowledge exchange between faculty and students to occur in an environment where faculty may feel they have a level of expertise, their research lab. Teaching ethics in a classroom setting can be daunting, but all faculty have had experience dealing with ethical issues in their research to some extent. These guidelines discussions may help open a door both in helping faculty feel more comfortable in teaching ethics, and, coupled with train-the-trainer resources, can serve as a segue to increasing discussions about ethical issues in the research setting. Previous studies have shown that discussions about research ethics can be either uncommon or nonexistent between mentors and mentees (Langlais and Bent 2014). We incorporate the concept of a boundary object, to describe these discussions of ethics-in-context. Our bottom-up approach works and helps prompt these kinds of conversations.

A boundary object is conceived of as a “shared space, where exactly the sense of here and there are confounded. These common objects form the boundaries between different groups through flexibility and shared structure – they are the stuff of action.”(Star 2010, p. 602–603). In essence, a boundary object is a piece of information or an object that is part of multiple social worlds (student groups and faculty supervisors, for instance) and facilitates communication between them. An essential dimension of a boundary object is *interpretive flexibility*, the capacity of the object or “thing” to inhabit a space between social worlds where it is “ill-structured” (i.e., having a malleable form) and accessible *as needed* by local groups that have only a vague notion of its commonality. Boundary

³ For example, University of Wisconsin-Madison. “Sample Compact from Laboratory of Dr. Trina McMahon for Graduate Students.” <https://ictr.wisc.edu/documents/sample-compact-from-mcmahon-lab/> (last accessed 20 October 2018).



objects can be many things, for example, computer programs, textbooks, or guidelines. Between faculty and students, and among graduate students working in labs, this might be a set of ethical guidelines that can be used to discuss research integrity issues, interpersonal relations, and power dynamics among lab members. These guidelines-as boundary objects that prompt conversation and potentially action-address the third challenge, how to initiate long term institutional change.

IMPLEMENTATION AND DISCUSSION

The project team worked with four active departments during the spring and fall 2017 semesters. During the first iteration, graduate students from the biomedical engineering and biology departments participated, and during the second, students from the physics and chemical and biological engineering departments. Working with a faculty member in each department, the project team identified an experienced graduate student who received a stipend to help recruit students to participate in the Student Ethics Committee and co-facilitate the workshops with the project team.

The students participating in the Student Ethics Committees had completed the CITI online RCR course and received some in-person training on various RCR topics through their graduate careers both in their academic classes and as part of their orientation before starting their research. The level of exposure to ethics varied between disciplines and research groups. For instance, physics students were well versed in issues of data management, while BME students knew far more about working with humans and animals in research.

Participants took part in six sessions of the Student Ethics Committee. The topics of these sessions were as follows:

1. Introduction to ethics, ethics codes, and guidelines;
2. Discussion of issues encountered by participating students/analysis of discipline-specific ethics codes;

Table 1. Departments and Number of Students Engaged Each Semester.

Departments	Fall 2017	Spring 2018
Biology	8	
Biomedical Engineering	7	
Chemical and Biological Engineering		7
Physics		9

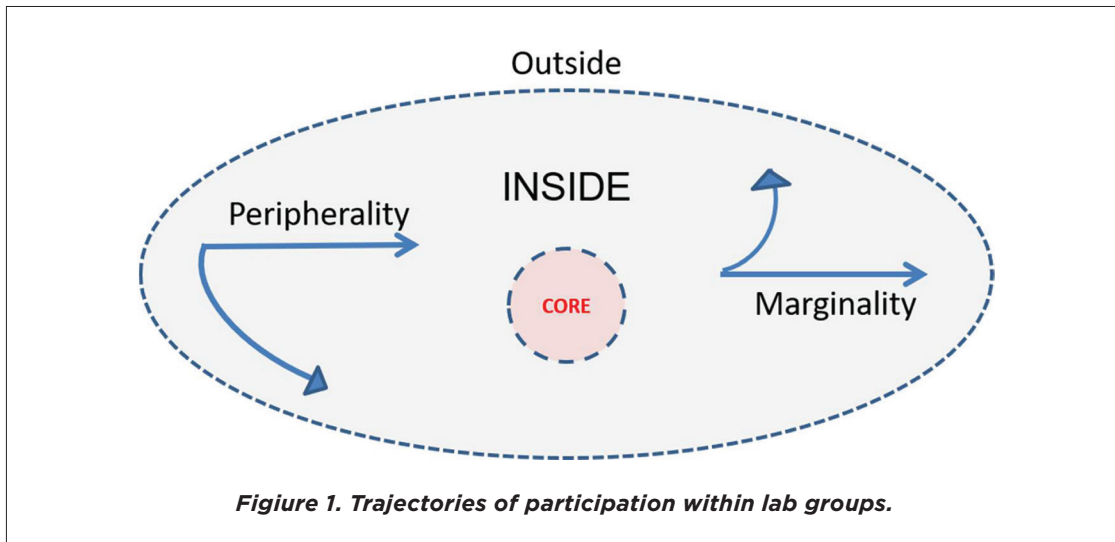


3. Extended discussion of the students' laboratory situation and ethical issues encountered;
4. Draft guidelines;
5. Discussion of guidelines;
6. Refinement of the first draft of guidelines.

The initial session focused on helping students grasp the terminology that would be used through the following workshop sessions and provided an overview of ethics in the research context. Case studies, additional readings, and impromptu discussions with members of the Ethics Center occurred throughout the following sessions as students asked questions and requested further information about specific topics they saw as necessary in their research experience. At the end of the workshop series, each of the four Student Ethics Committees produced the first draft of their guidelines. Guidelines focused both on RCR topics such as data management and authorship, but also clearly exemplified the concerns of the student committee. These included issues such as transparency (especially around expectations of working hours, credit, and research leading to a successful dissertation) interpersonal relationships (diversity, fairness, equal opportunity based on merit), and practices that lead to high quality research (leaving room for the trial-and-error mentality of research, avoiding pressure to get expected results). The project team will be publishing an article that focuses explicitly on the first draft of these guidelines in the upcoming months, but overall the guidelines developed by all four Student Ethics Committees fulfilled the original research hypotheses of the project. The guidelines reflect the current culture of experimental labs in these departments and the ethical issues that students think are important, especially surrounding relationships between fellow lab members.

In meetings, students raised questions that exposed concerns regarding day-to-day interactions and relationships within the lab among students and between students and PIs. Specifically, students talked about incidences of gender bias, and differential treatment of international students and other marginalized groups, issues that are typically not considered RCR ethical issues. Patterns of behavior involving power dynamics within the lab began to surface in these discussions. Existing hierarchical structures reinforce these dynamics and take for granted assumptions about the roles and responsibilities of lab members.

The theoretical model proposed by Wenger's social theory of learning (2003; 2010) is useful in analyzing comments from students about their lab experiences. In particular, Wenger's concept of peripherality and marginality provides a framework for understanding the trajectories of international students entering the lab. Figure 1 illustrates that all newcomers to the lab begin their tenure at the periphery, what Wenger calls an "inbound trajectory" (Wenger, p. 166). Over time they are expected to acquire the technical and social competencies to move toward the "core." This allows them to participate fully as lab members, where participation "describes the social experience of



living in the world in terms of membership in a social community and active involvement in social enterprises.” (Wenger, p. 55)

However, in both interviews and group discussions, international students frequently reported barriers such as language and cultural differences that push them into “identities of non-participation” (Wenger, p. 167), a form of marginal participation that limits their participation as full lab members. Wenger notes that “in some cases, forms of non-participation may be so ingrained in the practice that it may seem impossible to conceive of a different trajectory within the same community.” (Wenger, p. 167) Two sets of guidelines developed by the Student Ethics Committees spoke about equitable treatment for international students, and the initial discussions that prompted these inclusions came from the student facilitator, who was himself an international student. One key finding of the project was the critical role the student facilitators played in prompting discussions about these issues. By serving as a role model, the student facilitators helped other participants find the agency to feel comfortable discussing these issues with their peers.

At this current time, the project team has approached faculty members of each active department and asked them to provide feedback and suggest revisions to the guidelines. These comments and changes are then shared with members of the Student Ethics Committee, who discuss and revise the guidelines further. The next step is to present these draft guidelines at a departmental faculty meeting, and finally with the department as a whole.

The bottom-up approach of these guidelines offers a complementary process to top-down mechanisms for institutional change, which often take the form of new policies, ethics courses, or changes to the engineering curricula. The guidelines developed in the Student Ethics Committees offer both a reflection of the current research environment and give students a voice in addressing these



perceived issues. The iterative process of revising these guidelines engages multiple stakeholders at the university, including students, faculty, and administrators in conversations around ethics, and may facilitate significant (e.g., measurable) change from the research group up to department and college level. Furthermore, three of the four Student Ethics Committees suggested that a standing ethics committee of students and faculty be formed to provide future guidance and oversight. This fact seems to point to the effectiveness of this approach in engaging students in discussions about ethics and helping them play an active role in improving the ethical culture of research.

The project highlights several obstacles in changing the culture of research environments. The first is the fact that issues of power and inclusion in research environments are often either not addressed or only briefly addressed in traditional RCR training. The bottom-up approach of this project gives students the ability to first share their own experiences in a “safe” environment among peers. Students extrapolate from these discussions to produce guidelines that express their concerns and, through the iterative process of refining the guidelines, exercise agency in articulating issues that affect their research environments. The guidelines also help faculty become aware of these issues in research groups and potentially can act as a catalyst for positive change to occur. However, the ability to meaningfully address the often thorny issues of power and inclusion requires workshop facilitators – both faculty and student – to potentially step outside their comfort zone and help students effectively discuss these topics.

Stakeholder engagement in the development of the ethical guidelines is a critical piece of this approach. Without the active support of faculty, long-term cultural change is likely impossible. The project team has found that framing the guidelines as a snapshot of student concerns and as an opportunity to collectively improve the ethical culture of research in a department can help get faculty buy-in to this process.

ASSESSMENT TO DATE

Currently, the project team is working on the assessment of the project’s impact. Our assessment plan included a baseline survey of the university which asked respondents (233) about the importance of avoiding 18 different ethical issues in research, as well as how often they had discussed these issues with their research group, and how often they have observed these behaviors.

The team also conducted in-depth interviews with twenty-eight graduate students and two undergraduate students engaged in research that explored their experiences within their current group, relevant ethical issues, the culture of their research group, and how members of the research group communicate and collaborate. We also asked interviewees how they would mentor future students if they became a principal investigator. The project team also conducted site visits to 10 different labs at the university and sat in on research group meetings to observe interactions among members.



Graduate students who volunteered to participate in the Student Ethics Committees were asked to complete surveys and provided open-ended responses to prompts about the workshop sessions as to its success, impact, and potential improvements.

Finally, the guidelines developed by the Student Ethics Committees are undergoing topical and textual analysis. By comparing the topics that each student group addressed in their guidelines, analyzing which items were considered most important, and examining how this reflects the current ethical culture of their research environment, we seek to understand differences and similarities between disciplines in how the students attempted to avoid, remedy, or improve these situations.

Analysis of these assessments is ongoing, though preliminary results point to interesting differences in the ethical issues faculty and students see as relevant. Faculty were generally interested in traditional RCR issues that might impact the integrity of their research, such as data management and complying with human subjects regulations as well as other conventional RCR issues. Graduate students, while also seeing these issues as relevant, focused more on interpersonal relationships within the lab, mentoring, and issues of fairness. The interviews with students have provided useful insight into how aspects of hierarchy, communication, and hurdles faced by international students impacted students' perceptions of ethical culture.

LIMITATIONS AND FUTURE CONSIDERATIONS

The opt-in nature of this project is essential to highlight. All participants in this project - be they faculty or students - were volunteers and often expressed an interest in ethics. This effort did not include faculty who might be uncomfortable either in speaking about ethics in research groups or with this bottom-up approach. The project team provided letters of participation to students to include in their portfolios describing their involvement in the Student Ethics Committee. Similar letters of commendation or the ability to include participation in the guideline development process as part of a faculty's synergistic activities or community service may also help attract less enthusiastic faculty to participate.

Furthermore, students who volunteered to be part of the student ethics committee were in positions where they felt comfortable sharing stories about ethical issues they had encountered in research. Though the project team did use several online surveys and other methods to allow students to share stories and problems anonymously, better mechanisms need to be developed in the future to invite all interested students to contribute, including those who might not feel comfortable sharing in a group setting.

The fact that issues of power dynamics and inclusion/equal treatment emerged from our data does not imply that these issues will surface in every setting. However, project leaders and participating



department chairs who implement this bottom-up approach should be prepared to face these and similar issues if they arise. The traditional RCR topics of student/trainee relationships and mentoring provide a natural segue to power dynamics and relationships among lab members, and the growing spotlight provided by reports such as the U.S. National Academies report “Sexual Harassment of Women” in 2018 (NAEM 2018) also offers an excellent way to start a conversation around these issues. In workshops, the project team used the American Physical Society’s revised Code of Ethics as an example of how one professional association began to address the problems of harassment and bullying, and similar revisions to the American Geophysical Association’s code provide another pertinent example of how institutions can constructively deal with these topics. (APS 2018; AGU 2018).

The time commitment from students and faculty involved in the guidelines development workshop is formidable, about 6-8 hours a semester for the students, and far more for the facilitators. The iterative guideline development process also involves a large number of meetings and engaging with faculty and students in the revision process. Faculty, principal investigators, and department chairs play an essential gatekeeper role in this process. For the guidelines to play a substantial role in the orientation and ongoing discussions about ethical issues in research groups, it is imperative to have buy-in from these stakeholders. The guidelines are also not meant to replace existing policies, but rather to point to existing policies by frequently referencing them and facilitating further discussion about their implementation in the research environment.

The final goal of the project is to create a Guidelines Development Module with accompanying readings, case studies, slide decks, and a facilitator guide that can be used by institutions of all types to run a similar set of workshops. If you are interested in receiving more information about this project or in running a version of this module at your home institution, please contact Kelly Laas at laas@iit.edu.

CONCLUSION

Our research to date on ethics in STEM labs at Illinois Tech suggests that ethical issues in research labs extend beyond the commonly covered RCR areas to include social interaction, power relations, gender, and other forms of difference that affect peer-to-peer, supervisor-to-lab member, and PI-to-student relationships. We have found that creating opportunities in which students can interact as peers in a safe, uncritical environment allows for frank and open discussion about issues that they encounter that might otherwise not be articulated. Deliberations both among the Student Ethics Committees and with faculty responding to the draft guidelines have proven to be extremely rich and productive.

The project revealed that working conditions might vary considerably between individual laboratories and between departments within the same university. On the one hand, this may seem unavoidable



given differences in fields and different research situations. On the other hand, some differences in the working conditions may be due to unquestioned traditions or tacit assumptions. As the overall process leads to students and faculty talking about their everyday working conditions in research laboratories, it can be considered an opportunity for PIs to harmonize working conditions in the various laboratories.

While more traditional forms of ethics education help students understand the basic guidelines and policies surrounding STEM research, embedding ethics education in the research environment appears to help orient students to this new environment. It also helps them develop the vocabulary, nuanced understanding, critical thinking, and decision-making skills to effectively begin to address these issues as they arise in the research process and environment. Furthermore, this bottom-up approach seeks to give students a voice and ownership in developing methods to cultivate ethical cultures in research labs. The approach highlights current questions that exist and provides all stakeholders a chance to collaborate in working toward solutions.

OUTSIDE SUPPORT

Funding for this project comes from the National Science Foundation (Award #1635661) and would not be possible without the support of the Armour College of Engineering and the College of Science at the Illinois Institute of Technology.

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Chris Miller (she/her/hers) is a researcher, educator and practitioner working at the intersection of anthropology, design, and business. Her ethnographic study of process formalization and the relationship between innovation and formalization at a Tier One automotive supplier focused on the social and organizational dimensions of innovation processes. As a design anthropologist, Dr. Miller’s work is explicitly interventionist and transformative and engaged in all phases of the design process. Her research interests include socio-technical systems and the ways in which sociality and culture influence the design and adoption/adaptation of new products, processes, and technologies. Dr. Miller is also interested in communication and knowledge flows, especially between diverse groups, and collaborative innovation networks (COINs). As a Co-PI on an NSF study of Ethics in STEM research (NSF Award #1635661), she is designing an alternative to traditional ethics education that incorporates a series of group conversations within STEM labs that allow ethical concerns to emerge, be examined, and articulated from the “bottom up” in locally crafted guidelines that reflect the desired ethical culture of the lab.



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