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Implementing a Campus-Wide RCR Training Requirement for Doctoral Students

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Implementing a Campus-Wide RCR Training Requirement for Doctoral Students

Over the last few years, Responsible Conduct of Research (RCR) training has been taking on increasing importance in the graduate curriculum. This is primarily due to a change in policy that was promulgated by the National Science Foundation and to evolving guidelines for NIH training grants and fellowships. In 2011, the Georgia Institute of Technology (Georgia Tech) implemented an academic policy that requires all new doctoral students to receive RCR training. It was decided that the institution would move "beyond compliance" in the sense that doctoral students would receive RCR training irrespective of their funding source.

This paper outlines the strategy used to ensure that these students receive RCR training and seeks to highlight the challenges associated with implementing this training on a campus-wide scale at Georgia Tech. The aforementioned policy has both an online and an in-person component. For the purposes of this paper, the focus will be on the in-person portion. The policy is eventually supposed to grow to cover master's students as well but that process will not be discussed here.

Federal policies and RCR

Since 1989, NIH has required RCR education for trainees who are funded through certain categories of its grants.[1] In 2009, NIH made several key modifications to its RCR policy. Included among the changes is that NIH now states that "online instruction is not considered adequate as the sole means of instruction" and that "Acceptable programs generally involve at least eight contact hours".[2] It is also important to note that members of the research team are "highly encouraged" by NIH to be involved in educating their trainees about RCR.

NSF's RCR policy was officially released in 2009 and required of institutions that they develop a training plan for students and postdoctoral researchers who are funded by grants submitted or due on or after January 4, 2010.[3] At this point in time, NSF's policy does not specifically stipulate the format that the training should take, the amount of contact hours required, or the topic areas that should be covered. Although NSF has given broad latitude to institutions to determine what is best for their own trainees, it plans to review institutional training plans in the near future.[4]

Institutional approaches to RCR

The manner in which institutions have responded to the mandates from NIH and NSF has been rather varied. While NIH specifically requires an in-person RCR training component, NSF does not directly address the issue. This has led many institutions to

rely primarily on online training of some sort, including offerings from the Collaborative Institutional Training Initiative (CITI),[1] as a way of satisfying NSF's RCR policy.

Other institutions not only include an in-person training experience for NSF-funded trainees but for the larger graduate population as well. For example, Penn State University's *SARI@PSU* program requires of graduate students, regardless of funding source, that they participate in at least five hours of "discussion-based activities".[5] It is largely up to the individual colleges at Penn State to determine what these activities will involve. Duke University's approach involves an RCR orientation program for all new doctoral students along with follow-up training forums.[6] The number of hours that Duke doctoral students must attend varies depending on their discipline of study. Due to NIH's influence, doctoral students in biomedical disciplines at Duke, and at other institutions as well, are usually required to receive more RCR training hours than their counterparts in non-biomedical disciplines.

The approach at our institution

To reiterate, there are two components to the RCR academic policy at Georgia Tech: (a) online training and (b) in-person training. For the in-person portion, doctoral students must complete a campus-wide RCR course or a program-specific "in-house" approach. The campus-wide course is for one-credit and is available to any graduate student. Individual academic programs are both permitted and encouraged to develop their own in-house approach in lieu of the campus-wide RCR course. Some academic units have already done so. For example, the School of Chemical and Biomolecular Engineering integrates RCR material into its first-semester research orientation course required of all of its new doctoral students.

The underlying logic of the in-house option is that RCR content should be more directly tailored to the student's discipline of study. Traditionally, RCR cases and other materials have been molded by concerns originating out of biomedical and social-behavioral research fields. Being an institution with a strong focus on science, engineering, and technology, it is especially important that a "one size fits all" biomedical model is not applied to students in every discipline.

Challenges to date

While the RCR requirement described here is from an academic policy, like many institutions, its emergence was initially motivated by a compliance policy. We have sought to align these two policies as much as possible, but faculty confusion and other lingering issues still exist. Further, the challenges associated with implementing the academic policy have been non-trivial. These challenges include: (1) having the human resources to offer a sufficient number of in-person courses with reasonable class sizes to

[1] Note: Dr. Borenstein is a paid consultant for the CITI Program, which is located at the University of Miami; but its online training courses will not be the focus of this paper.

facilitate effective dialogue; (2) identifying faculty members with the expertise relevant to ethics and/or RCR; and (3) encouraging academic units to develop their own "in-house" approach. These challenges will be discussed in further detail below.

(1) The number of course offerings

With over 580 new doctoral students per year, a key challenge is scheduling a sufficient number of courses to accommodate the students and still having a small enough class size to provide them with a meaningful educational experience. At the present time, there is one main instructor for the campus-wide RCR course. This certainly raises questions about the sustainability of the RCR program. For example, overlapping open time slots need to be found in the schedule of the instructor and the students for the collection of RCR courses. To address some of the relevant issues here, a group of faculty members have been offered summer salary support to teach the course as well (this will be discussed in more detail below).

(2) Expertise

It can be difficult to identify faculty with sufficient expertise and comfort level to instruct lessons related to RCR. This is somewhat similar to the challenge relating to ABET's undergraduate ethics requirements, i.e., finding engineering faculty who are capable and willing to discuss ethics in their courses. At our institution, undergraduate engineering ethics courses are normally taught by professors who have degrees in philosophy.

Faculty in biomedical disciplines are typically more used to at least some of the RCR core topics areas in large part because many of them conduct work in the realm of human or animal subjects research. It is already common to discuss ethical issues relating to that kind of work. In general, however, faculty have not been formally exposed to the same or similar sort of RCR content that the students will confront. Among the main reasons for this is that the aforementioned federal mandates are relatively recent and the mandates do not normally require principal investigators or other faculty to complete RCR training.

(3) In-house approaches

Graduate degree programs at Georgia Tech are highly autonomous. It is not consistent with our institution's de-centralized culture to implement a "top down" mandate that would require of all graduate units that they create their own RCR courses. To date, larger doctoral programs have opted to send their students to the default campus-wide course; a key reason for this is that there is no obligation to commit faculty effort or other resources if they do so.

Before a unit can offer an in-house approach, a proposal must be formally approved by a faculty committee. This committee is compromised of representatives from all of the colleges on campus. The committee reviews an in-house proposal by checking whether it is consistent with the tenets of the RCR academic policy. At the present time, roughly 30-35% of new doctoral students will complete their training through an in-house

approach.[2] This represents nine graduate units that have obtained approval to instruct their own students. Most of these programs, five of the nine, are within the College of Sciences; units within that college that have created in-house training range from the smallest, approximately 3 new doctoral students per year, to the largest, approximately 65 new doctoral students per year. In total, the College of Sciences houses approximately 20% of the doctoral student population.

Generally speaking, most of the units within the College of Engineering have thus far declined to create in-house training, and this includes some of the largest programs on campus. The two exceptions are Chemical and Biomolecular Engineering and Biomedical Engineering, which is not surprising given their strong biological focus and significant reliance on NIH funding for their respective graduate students. In sum, the College of Engineering contains approximately 60-65% of the doctoral student population, yet only a small fraction of those students receive RCR training "in-house". Further, although it is a much smaller entity, none of the units within the College of Computing have created an in-house approach.

In contrast, a majority of the academic units in the College of Sciences (including Biology, Chemistry, Psychology, Earth and Atmospheric Sciences, and Applied Physiology) have chosen to develop in-house domain-specific RCR material, typically integrated into a first-semester course required of all of their new PhD students.

Doctoral students in the social sciences are typically housed within the Ivan Allen College of Liberal Arts. Since many of these students may end up working with human subjects, one might hope that there would be widespread "buy-in" with regard to RCR training. Yet at the present time, only one school, Public Policy, out of the six within that College offers its own in-house RCR training. While social scientists and others might contend that RCR pedagogy is too influenced by concerns emerging out of biomedical fields, the core topics within Public Policy's approach are rather similar to what is covered in the other RCR courses offered on campus.

Incentivizing the faculty

To incentivize faculty and to build faculty expertise in teaching RCR topics, salary funding was provided for three faculty members in the summer of 2012 in return for instructing sections of the campus-wide RCR course. This approach was adopted for three main reasons. First, it was an attempt to build a broader collection of RCR expertise on campus. The faculty members who were selected for the summer positions had to attend a mandatory RCR orientation hosted by the primary RCR instructor on campus. In other words, a "train the trainer" approach was implemented whereby the faculty members learned about the format and content in the campus-wide RCR course.

[2] The authors would like to thank Judy Willis, Administrator of Graduate Research Ethics Programs at Georgia Tech, for compiling this information.

The second reason for this approach is that it spread the teaching load necessary for covering new doctoral students over a larger number of people. Up until that point, the campus-wide course had been taught by one person. Third, the initiative was intended to encourage these faculty members to build an in-house approach in their home academic unit. The lack of an in-house RCR approach by the academic unit of the faculty applicant was a key criteria used for selecting a summer instructor.

The results from the first iteration of the summer instructor program, in 2012, are somewhat mixed. Eleven faculty applied for three slots; however, all but one came from academic units that already had an in-house approach in place. Further, there were zero applications from the College of Engineering, which again is the entity that houses the large majority of our doctoral students.

The second version of the instructor program is slated to take place during the summer of 2013. Two of the three selected recipients are associated with the College of Engineering, where the fewest number of in-house approaches exist. We specifically stated in the call for applications that schools without an in-house approach would be preferentially selected.

The pedagogical approach

Beyond the logistical and other challenges mentioned above, there are also pedagogical issues regarding the content in RCR courses. A key issue is deciding which format should be used for presenting the information to the students. Similar to the approach used in many undergraduate engineering ethics courses, case studies are usually integrated into the RCR courses offered on our campus. Case studies are often considered to be an effective approach for introducing engineers to ethical decision-making.[7]

There are two main ways in which cases are used in the campus-wide RCR course. The first way involves having the instructor present a case to the entire class and then the class discusses the relevant ethical issues in the case. The National Academies' *On Being a Scientist* is often used as a source for such cases.[8] The second way is to have the students form into groups of approximately 4-6 members. Each group is then responsible for presenting a case to the rest of the class from a list of pre-selected topics. For example, one of the group topics asks students to grapple with the issue of whether it is appropriate for a researcher to publish a paper that describes how an alleged vulnerability in the U.S. power grid could be exploited.[9]

Another key issue is whether to focus primarily, or wholly, on compliance-related matters or whether underlying philosophical concepts should be covered. As is the case with undergraduate engineering ethics courses, one could dispute how necessary it is to introduce students to the theoretical side of ethics. Since the primary instructor for the campus-wide RCR course is trained in philosophy, basic ethical principles and theories are normally presented to students. However, this does not always occur; it varies depending on who the particular instructor is for a given course.

On a related note, it is also important to decide which specific topics should be covered. RCR is highly influenced and molded by concerns emerging out of the life sciences, and model curricula evolved from the greater attention RCR education has received in those fields. In the U.S., RCR primarily emerged from federal policies and from federal regulations such as the "Common Rule", which pertains to human subjects research. In general, RCR courses on our campus typically cover the topics delineated in NIH's RCR policy,[2] which were largely derived from the "ORI 9" topical areas.[10]

The need for engineering-specific materials

There exists an unmet opportunity to create engineering-specific graduate-level RCR training. During the summer of 2012, a committee of senior graduate educators and directors from the College of Engineering identified several topic areas that would be ideal topics to incorporate into RCR training. Beyond the topics normally covered in RCR education, the group suggested:

- Intellectual Property
- The Use of Computers in Research
- Validation and Open Data Access
- Engineering and Professionalism
- Export Control
- Dual Use

Ideally, engineering faculty and others will assist with the creation of discipline-specific content in these and other topic areas. One potential pathway to make this a reality is to use the *Coursera* platform as a way to introduce students to the content.[11] However, that plan remains at a very early stage of development.

The need for assessment

Many scholars are interested in investigating the effectiveness of ethics and RCR training.[12-13] Some of the assessment efforts have been supported by the Council of Graduate Schools' (CGS) *Project for Scholarly Integrity*.[14] Along these lines, there is a profound research opportunity at our institution; yet, it is one that remains largely unfulfilled. The ongoing implementation challenges relating to developing an academic policy, which covers all new doctoral students, and resource limitations have not allowed for a formal assessment of our RCR program at the present time.

Conclusion

This paper describes initial stages of an RCR plan that covers doctoral students at Georgia Tech. Several of the main challenges have been described, including the key one that is can be difficult to incentivize academic units on campus to develop their own in-house training when they can opt to send students to a campus-wide course. The hope is

that a growing coterie of faculty will gain expertise in this realm and become part of a type of education that is taking on increasing importance.

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