Education in the Responsible Conduct of Research and Scholarship (RCRS) at the University of Michigan FY 12

Compiled by Pat McCune, Rackham Graduate School, August 27, 2012

Background

The University of Michigan’s Task Force was formed in response to the announcement from the National Science Foundation (NSF) of the planned implementation of Section 7009 of the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science (COMPETES) Act. Under the shared leadership of Toni Antonucci, Associate Vice President for Research (OVPR) and David Engelke, Associate Dean (Rackham), the Task Force concluded that each of our schools and colleges would be responsible for developing their own method of providing RCRS education appropriate to the needs of their research fellows, graduate and undergraduate students in order that those receiving NSF funding would meet the new requirements. This approach also allows those schools and colleges which receive funding from the National Institutes of Health (NIH) to provide instruction appropriate to that agency’s mandates.

A working group known as RCRS Contacts was formed to address the complexities involved in identifying those who receive or are likely to receive funding from NSF or NIH sometime during the academic year, and then tracking completion of required training in order to maintain a record of compliance. As a result of the efforts of Elaine Nowak, Brian Robson and others in Information and Technology Services (ITS) these operations are now achieved through use of a service indicator in M-Pathways.

By the end of FY11 a description of the plans for how U-M’s schools and colleges would meet these NSF and NIH mandates was filed in the C-Tools site known as RCRS Plan. In May, 2012 Dr. Engelke and Toni Antonucci requested a report from the schools and colleges on how their plans for RCRS education was carried out during the past year, as well as how many students and faculty were involved.

The following report represents an extended summary of the responses provided to Dr. Engelke and what if any changes will be made in FY13.

Business

The School had no students or postdoctoral fellows supported by NIH or NSF funding this past year, so they did not provide any activities related to the formal RCRS requirements. However, they are involved in RCRS related activities as a natural result of their research activities. They review RCRS content in their orientation program and each Ph.D. area of study runs a seminar course during which the research process and specific research studies are discussed.

The School has a system in place to identify students and postdoctoral fellows who need RCRS training and to track whether the training is completed. This is administered by the Research and Business Manager.

In the coming year students and postdoctoral fellows who need RCRS training will be asked to register for Ethical Conduct of Research (NRE 677, Section 089), taught by Rebecca Hardin and offered in alternate years by CAUP and SNRE.
Dentistry

The School has a phased plan that will be instituted over four years and will eventually include all students, faculty and research staff. During this past year in the first phase, RCRS training was provided for current NIH or NSF trainees, all doctoral students, all postdoctoral trainees or fellows, and junior faculty members with a career award.

These students and trainees were identified through the Oral Health Sciences Ph.D. program student members’ database, the student F award database, the Tissue Engineering and Regeneration Training Grant database (T32) and the postdoctoral fellows school appointment database. These databases are managed via the Office of Research and Ph.D. Training, under the Associate Dean for Research.

The RCRS content was embedded in the seminars and journal clubs of ORALHEAL 811 and identified specially as the *Culture of Science* theme. All Oral Health Sciences Ph.D. students are required to attend all ORALHEAL 811 seminars and journal clubs throughout their time in the program. Attendance is tracked by sign-in and data base, for review by the course director. In the journal clubs faculty lead presentations and discussion. In the seminars there were faculty presentations by internal and external speakers, followed by extended audience discussions and then lunch with trainees. All of these journal clubs and seminars will be podcast and available for review. This course includes a formal school-wide seminar each Thursday at noon and a journal club each Tuesday at noon throughout the fall and winter terms. The journal clubs provide the opportunity for face-to-face instruction. An example could be presentation of a recently retracted or withdrawn journal article, with reason for retraction, significance of retraction for the field and for science at large; and then discussion of data management or authorship or plagiarism or other topic, as appropriate to retraction.

Tracking of the training completion of all who took part in some aspect of the school’s offerings can be challenging because though training responsibility may fall where the funding originates, the students could be from different schools or programs, as in the case in bioengineering. They have a six-hour course but since they are in a lab at the school they only participated in the one-on-one student and mentor discussions. So the school can only affirm that they participated in a component of the training, but in combination with RCRS offered in their program they may have their eight contact hours.

There were seven faculty discussion leaders from the school and three from elsewhere at U-M. There were 13 lab mentors and some mentored multiple students. There were 19 students and one faculty member who completed the school’s RCRS course this past year. In addition, there were 18 other students and 42 faculty or staff who attended some of the training.

Education

Only the School’s graduate students and postdoctoral fellows funded by NIH or NSF were required to participate in 2011-2012. The instructional plan is based on a modular system. This past year only three of the planned five modules were offered, one each in January, one in March, and one in May. The modules consist of two-hour sessions and leaders use a mix of pedagogical formats, including faculty panels, scenarios and cases, and lectures. All sessions were either discussion or activity-based. There were resources for advance reading in C-Tools.
Over the course of the five modules participants are exposed to the following issues:

- Life cycle of a research grant
- Hiring responsible research employees, providing appropriate training, and managing a team
- Managing conflicts of commitment and interest
- Establishing and maintaining the integrity of research efforts
- Ethical treatment of human subjects
- Promises made: Applying for funding and demonstrating capacity to conduct responsible and ethical research
- Achieving IRB approval and compliance with IRB regulations
- Recruiting and enlisting of participants
- Data Management
- Collecting data
- Securing data and maintaining data integrity
- Cleaning data
- Managing data (long-term storage and security)
- Where do the data reside?
- Who has access? When? Why? What is required to gain access?
- Data monitoring procedures
- Archiving and access procedures
- Disseminating Findings
- Making instruments and data publicly available
- Authorship and acknowledgments
- Establishing and documenting integrity of claims, warrant, and conclusions
- Originality of claims/plagiarism

Elizabeth Moje led the first session, which was attended by approximately 14 doctoral students and postdoctoral fellows funded by NIH or NSF. Michael Bastedo and Elizabeth Moje led session two, which was attended by approximately 20 participants. Over 40 students and fellows participated in session four (after a more aggressive email blast to PIs, students, and fellows). Larry Suter, a former NSF program officer, co-led the session with Elizabeth Moje.

The School will continue to offer sessions, beginning with session four in the fall term 2012. Then they will begin the module rotation anew in the late fall. All graduate students and postdoctoral fellows will be required to participate, but will have two years to complete their required four modules. They will offer the full five modules in 2012-2013. Instructors will be invited faculty members and research scientists, as well as prominent methodologists and researchers from other institutions.

The School is continuing to develop a system for recording attendance; currently participants register using card readers but it remains to be determined who should ultimately be responsible for reporting the names once they have completed all four modules.

**Engineering**

The College’s RCRS program is designed for all students and postdoctoral research fellows with NSF and/or NIH funding. It includes mandatory college-wide workshops as well as interactive sessions between graduate students and their mentors. Each workshop was offered three times a semester in both fall and winter terms. Special training for summer research undergraduate students is now provided as well.
The PEERRS online course is a prerequisite that must be completed prior to the workshops. Participants are required to obtain PEERRS certification in:

- Foundations of Good Research Practice
- Conflict of Interest
- Authorship, Publication and Peer Review
- If students or trainees use human and/or animals in their research, then they are also required to take the relevant human and/or animal training course(s) from the following:
  - Human Subjects - Biomedical & Health Sciences, or
  - Human Subjects - Social & Behavioral Sciences, and/or
  - Orientation to the Animal Care and Use at the University of Michigan

Participants then were required to complete the three two-hour workshops. The first covers:

- Appropriate citation of sources and avoiding plagiarism
- Authorship and publication practices and responsibilities.
- The second workshop in the series reviewed:
  - Acquisition, management, ownership and sharing of data
  - Avoiding research misconduct, including data fabrication and falsification
- The third required workshop was devoted to issues of:
  - Personal, professional, and financial conflicts of interest
  - Supervisory and mentoring relationships and responsibilities
  - Responsibilities of collaborative research

If required, training on the protection of human beings and welfare of laboratory animals during research was automatically assigned during IRB and UCUCA protocols.

The final two-hour component of the RCRS training focused on mentor-student discussions. A packet of 42 engineering–specific case studies were prepared from online resources, and the College’s RCRS team introduced the material at faculty meetings in each department of the college. The case studies have a series of questions and discussion points for faculty. Each department was free to determine the best method of delivery. Some examples of current practices are:

- A series of 15 to 30 minute discussions, led the by faculty advisor, during regular research group meetings
- The faculty advisor asks his or her graduate students and/or postdoctoral fellows to lead the research group discussions on particular case studies
- Multiple research groups, centers or major laboratories hold joint meetings to conduct casebook discussions
- Interactive departmental workshops

Master’s students who are not funded by NSF and/or NIH were not required to complete this training component.

Each attendee was added to the college’s RCRS C-Tools site for access to a broad array of materials, resources, and links. Student surveys were conducted for each workshop. Over the course of the year, only 40% felt the workshops introduced them to new ideas, yet 80% felt that the workshops were useful and informative.

Thirteen different faculty members taught 20 workshops over the spring, fall and winter terms. A total of 358 students completed the training in fall 2011; another 246 students completed in winter 2012.
A tracking system was put in place over the course of the year. Leadership in the college will continue to develop and refine the tracking system, and department and student communications over the next year.

The College’s plans for the coming year are essentially the same.

Information

This School’s undergraduates who serve on research grants (regardless of funding agency) will be required to complete the training modules offered during their time on the project. Any master’s degree student who is appointed as a GSRA is required to complete the training. The identification and tracking of master’s and doctoral students and postdoctoral research fellows needing training will be managed by the SI research office in coordination with SI Student Affairs.

The School designed a two-prong strategy for training undergraduate students, graduate students, and postdoctoral fellows who are paid from any NSF research or training grant or fellowship or from NIH fellowships, training grants, and mentored career development grants. The first component consists of coursework in SI 701, SI 754, and SI 840 that cover the topics listed below. The second consists of four 90 minute workshops covering these same aspects of RCRS and two hours of documented one-on-one training with the faculty mentor.

In total, the RCRS topics are:

- Understanding and avoiding plagiarism
- Acquisition, management, ownership and sharing of data
- Working with and protection of human subjects
- U-M systems regarding human subjects: PEERRS training, IRB committees, and paying human subjects (HSIP)
- Research misconduct, including data fabrication and falsification
- Personal, professional and financial conflicts of interest
- Supervisory and mentoring relationships and responsibilities
- Responsibilities of collaborative research
- Authorship and publication practices and responsibilities

This year there were 21 students who completed the training as part of SI 701, SI 754, and SI 840 and four faculty members who were involved in the training. Only one workshop was offered this year though there were none who needed to complete the training outside the classroom.

The plans for RCRS instruction in the School remain the same for the coming year, with improved documentation of completion.

Institute for Social Research

Neither of these units offered RCRS training in 2011-2012 but instead encouraged the few who needed it to take what was being offered in their primary programs.

Beginning in the fall term 2012 the Populations Studies Center (PSC) will offer Sociology 830, Population Workshop, which will be open to all Sociology and Economics Department graduate students as well as
PSC trainees. In the winter term 2013 the six sessions will take place at the Institute for Social Research (ISR) without a formal course and will be open to PSC trainees as well as all Sociology and Economics Department graduate students. PSC pre-doctoral trainees whose primary program is Sociology, Economics, or Public Policy will attend these sessions. PSC pre-doctoral trainees whose primary program is in Public Health or Social Work will attend the RCRS training in their primary department. All PSC postdoctoral trainees will take RCRS training offered by PSC and ISR.

The course will consist of six 90-minute sessions. Sessions will be directed by one or sometimes two faculty members. There will be readings for each session. Each session will include some presentation of the main issues and some discussion. A record will be kept of who has attended each session. To fulfill the RCRS requirement, a person will be required to attend the topics for all six sessions, either in the fall or the winter, or some sessions in the fall and other sessions in the winter.

The topics for the six sessions are:
- Research misconduct, admission of mistakes, plagiarism
- Conflict of interest, data acquisition, data release, and hoarding of data
- Human Subjects presentation and discussion
- Peer review, responsible authorship and publication, and choice of journal or other publication outlet
- Mentor/mentee relationships, interdisciplinary research, collaborative research, work with government and industry, and classified or proprietary research
- Scientist as a responsible member of society, whether not to publish findings (enhancement of viruses), whether to consider political/social impact of findings (race and ethnicity), whether and how to simplify for a general audience, issue of evidence for climate change, policy implications of research

**Kinesiology**

Kinesiology 616, Professional Skills for Research Scientists (3 credits), provided RCRS training for graduate students and postdoctoral fellows. This course covered scientific writing, grant funding, research presentations, career skills, and other facets of responsible research. The course was offered in the winter and met once each week for sessions of 3 hours each. The course format was both lecture and discussion. Students completed bi-weekly homework assignments, a final course project (a grant application), and a final exam. The RCRS training was blocked into three class sessions for a total of nine hours so that undergraduates and post-doctoral researchers needing to complete RCRS training could attend just the three RCRS class sessions to receive a certificate of completion.

By the end of this course, students should be able to:
- Carry out literature searches for journal articles, conference proceedings, patents, and funded grant proposals
- Define critical aspects for making a successful research presentation
- List characteristics of good scientific writing
- Identify critical scientific writing mistakes
- Describe the process for reviewing journal manuscripts in detail
- Define ethical standards for research including journal authorship, grant writing, collaborative research, protection of human research subjects and animal welfare in research, supervisory and mentoring relationships, and other scientific tasks
• Explain the procedures for grant application review at the National Institutes of Health (NIH) and the National Science Foundation (NSF)
• Prepare an NIH or NSF style grant application
• Identify common parts of a job application for a faculty position and prepare an example job application
• Describe the process of a typical interview for a faculty position
• List and describe non-academic careers for individuals with a Ph.D.
• Compare and contrast the duties of being a faculty member at a small teaching institution, being a faculty member at a large research extensive university, holding a job as a research scientist in industry, and working for a consulting firm

This past year one faculty member was involved with the course that was completed by five graduate students and one postdoctoral fellow.

The School has decided to only offer this course every other year due to the low number of students and postdocs needing the course. As a result, the course will not be taught this coming year. Students and fellows would be able to take the course for RCRS training in winter 2014.

**Literature, Science and the Arts**

The College met the RCRS requirement by offering two academic courses through the University Course division: UC 415 for natural sciences and 416 for social sciences. This year, only the UC 415 course was offered due to a lack of students identified as funded from the social science division in time for a course to be launched. Some departments offered their own course, either as a new offering or adapted an existing course to ensure coverage of RCRS topics in the curriculum. These courses are eligible for RCRS credit:

- UC 415
- GEOSCI 531 (fall 2011 only)
- EARTH 495 (winter 2012 and afterward)
- PS 500
- PSYCH 605/805
- STATS 810

A few of the College’s departments require that students take PIBS 503, which is offered by the Medical School and satisfies the RCRS requirement. In fall 2011, the college offered a total of eight sections of UC 415 in fall 2011, and in winter 2012, offered seven sections covering Mathematics, Physics, MCDB, and Chemistry. Mathematics used a team-teaching method with five faculty participating. Otherwise, all other sections were taught by only one instructor.

**UC 415 Fall 2011 Enrollment**

<table>
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<th>Department</th>
<th>Instructor</th>
<th># Students</th>
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As shown in the above charts provided by Paula Trail, a total of 418 LSA students completed RCRS training this year. She noted that that in fall 2011 there were an additional 93 people who participated in the courses who were unable to officially register for the course for different reasons and were manually uploaded to receive credit. In winter 2012, there were 52 people attending the course who could not officially register.

Another challenge is that although ITS staff developed reports to indicate who needs training as well as who has completed training this isn’t sufficient. The reports do not indicate identical information, specifically which school or college the student is in. Trying to marry the two reports together to ensure that all students have completed the training is not easily accomplished at this point. ITS staff are aware of this issue but it is not a priority for them at the current time.

LSA will continue to offer UC 415 as well as allow departments to use courses that the Dean’s office personnel have approved for RCRS credit. ISR’s Population Studies program has agreed to allow Economics and Sociology students who are funded through LSA to participate in training through Population Studies, where many Economics and Sociology students are also funded. Otherwise, no new changes will take place in the college’s training program in FY13.
Medical School

In the School this past year, as in many prior years, Kate Barald taught PIBS 503 Research Responsibility and Ethics. The topics covered through reading, podcasts, and other assignments in addition to face to face small group discussions, were:

- Fraud, Fabrication, and Plagiarism
- Data Storage and Ownership and Peer Review
- Animal Use and Care
- Human Subjects Research and IRBs
- Conflict of Interest
- Research in the Global Workplace
- Dual Use Issues

Participants were also required to engage their PI, thesis mentor, or rotation mentor in a discussion of ethical practices particular to the laboratory. The PI was required to complete and submit a form to that effect, and students emailed confirmation to Dr. Barald and copied the PI.

A total of 163 students enrolled through Wolverine Access, and an additional 87 postdoctoral fellows enrolled by submitting a form through C-Tools, for a total of 250 participants. There were 83 faculty and other instructors involved.

The School’s plans for the coming year are the same.

Natural Resources and Environment

Rebecca Hardin taught a seminar course, Ethical Conduct of Research (NRE 677, Section 089), in fall term 2011. This course is offered once a year in collaboration with the College of Architecture and Urban Planning.

This seminar used a series of modules to introduce students, faculty, and other researchers to key ethical and professional issues in responsible conduct of research and scholarship. It combined face-to-face presentations and discussions with online instruction and assignments. To pass overall and gain compliance, participants were required to complete four of the seven modules and so had eight in-class contact hours.

At the initial meeting seminar participants were selected to work with the instructor in facilitating each module, using free-form theatre, slides, other media or scientific print sources to contextualize and illustrate content. Each module had some reading material and assignments to be completed either in class or outside of class. They were graded satisfactory/unsatisfactory.

The topics covered included:

- Understanding and Avoiding Plagiarism
- Data Acquisition, Use, and Management
- Data Fabrication and Falsification
- Collaborative Research, Authorship and Publication
- Protection of Human Subjects
The seminar was completed by 12 graduate students and postdoctoral fellows. Seven participants were affiliated with SNRE. The seminar will be offered in alternate years by this school and Architecture and Urban Planning. The graduate students and fellows also may choose to attend a seminar on research ethics offered in Ecology and Evolutionary Biology.

The School now has a system in place to identify relevant students and postdoctoral fellows who need RCRS training and to track whether the training is completed. This is administered by the Research and Business Manager.

Nursing

All graduate students and postdoctoral research fellows at the School received RCRS education tailored to their programs. Each of these is described here.

Master of Science students were informed about the Master’s Handbook (available on the website) at new student orientation. This outlines the School’s Student code of Academic and Professional Conduct and has content on plagiarism, and on the school and university IRB requirements. All requirements were discussed fully at orientation and this one-hour session is documented through attendance rosters and the signed receipt for the Handbook which is in academic files. They then received formal instruction in Nursing 536, Utilization of Nursing Research in Advanced Practice (3 credit hours). In addition, Nursing 699, Nursing Scholarly Project, is an optional requirement that few students in this program selected. If a student does select Nursing 699, it is completed as an individualized mentoring project between student and faculty advisor. Mentoring includes appropriate citation of sources, authorship and publication practice, management and ownership of data, protection of human research participants. The appropriate IRB review is obtained for all projects.

Doctor of Nursing Practice (DNP) students were informed about the DNP Program Handbook (online) at new student orientation which outlines the School’s Student code of Academic and Professional Conduct and has content on plagiarism, and on the School and University IRB requirements. These requirements were discussed fully at orientation and this two-hour session is documented through the attendance roster and signed receipt for the handbook which is kept in the academic file. At orientation they all received a hard copy of Guidelines for Scientific Integrity. Students are oriented to this and then the documents are discussed in the three required DNP core courses (Nursing 810, Nursing 811, and Nursing 910) for a total of 11 hours. All DNP students were required to complete all PEERRS modules during their first year in the program. Certificates of completion are maintained in students’ academic files. Nursing 955, DNP Scholarly Project, involved individualized mentoring between student and faculty advisors as students carry out their scholarly project. Mentoring sessions included discussion of appropriate citation of sources, authorship and publication practice, management and ownership of data, and protection of human research participants.

All Ph.D. students were informed about the Ph.D. Program Handbook (online) at new student orientation which outlines the School’s Student code of Academic and Professional Conduct, and contains content on plagiarism, and on the School and University IRB requirements. These requirements were discussed fully at the two-hour orientation and documented in the attendance roster and signed
receipt for the handbook in academic file. At orientation all students receive a hard copy of *On Being a Scientist: A Guide to Responsible Conduct in Research and Guidelines for Scientific Integrity*. Students were oriented to this and then the documents were discussed in the four required Ph.D. core courses (Nursing 801, Nursing 821, Nursing 830, Nursing 831) for a total of 11 hours. All Ph.D. students were required to complete all PEERRS modules during their first year in the program. Certificates of completion are maintained in students’ academic files. In addition, Ph.D. students all completed a semester-long mentored research experience with a faculty mentor, working on the mentor’s research and discussing various aspects of scientific integrity as they relate to that experience. Then a report was filed by the student and mentor addressing how the research experience was completed and what aspects of scientific integrity were addressed. This is filed in the student’s academic record.

All Ph.D. students on NIH training grants participate in an hourly seminar (3 weeks per month) to discuss various aspects of research. This includes presentations by faculty and student peers on their research and related topics on scientific integrity. Participation is documented by signed attendance rosters. Nursing 995, Dissertation Research, involves individualized mentoring by faculty advisors as students carry out their dissertation requirement. Mentoring includes discussion of appropriate citation of sources, authorship and publication practice, management and ownership of data, and protection of human research participants.

All post-doctoral fellows were required to complete pertinent PEERRS modules in the conduct of their research. Certificates of completion are maintained in post-doctoral fellows’ files. Issues germane to the protection of research participants were regularly discussed in research team meetings of which post-doctoral fellows are members.

Currently the School has a T32 training grant, Health Promotion Risk Reduction Interventions with Vulnerable Populations. As part of this training grant, pre- and postdoctoral fellows were required to attend a monthly two-hour seminar. Topics covered as didactic presentations in addition to individual student presentations include: authorship and publication practice, management and ownership of data, protection of human research participants, and other issues related to scientific integrity. A total of three hours was specifically dedicated to RCRS topics and participation documented with signed attendance rosters. Each faculty sponsor and postdoctoral fellow on the T32 developed an individual plan germane to the particular research project. This plan was reviewed and documented at individual review meetings with each postdoctoral fellow. Coverage of topics related to responsible conduct of research and scholarship were included in regular written reports and reviews of each fellow’s experience and this is documented in each postdoctoral fellow’s file.

In total, there were 110 students at the master’s degree level who met RCRS requirements through coursework. At the doctoral level, a total of 45 students met these requirements through coursework. As part of the structured training provided as part of the T32 grant, four pre-doctoral students and 5 postdoctoral fellows received appropriate RCRS training.

The School will follow the same overall plan in the coming year with the addition of improved documentation practices for student and research fellow participation.

**Pharmacy**

The College required Medicinal Chemistry 660 of all the first-year graduate students; this was offered in the winter term. Ron Woodward was the lead instructor. During the first-year orientation all students
are presented with core concepts of professional conduct. Topics addressed include: cheating, plagiarism, fabrication, aiding or abetting dishonesty, falsification of records.

This is an introductory course in research methods and proposal writing. Part of this course focuses on issues regarding collaborative research involving human subjects as well as research using vertebrate animals. Meeting times were Monday 1:00 – 2:00 and Thursday 1:00 – 3:00. Note that approximately four hours were devoted to RCRS issues associated with human subject, animal research, responsibilities of collaborative research. The format of the class is both lecture and discussion, with required online completion of PEERRS modules. The text used included selected chapters of Scientific Integrity by Francis L. Macrina. Case studies at the end of each chapter were assigned to groups of students (composed of a mix of each of the college’s departments). The student group presented the case and the options. This was followed by full class discussion facilitated by the instructor.

Students from all of the College’s departments participated for a total of 27 students, as did one faculty member.

The plan for coming year is that Ron Woodard will again lead the course for all new graduate students at the college.

Public Health

The School offered training to all of its postdoctoral fellows, doctoral students, and first-year master’s students in the 2012 winter term. Successful completion required attendance and participation in each of the following eight modules:

- Research and Academic Misconduct – Fraud, Fabrication, and Plagiarism
- Intellectual Property – Data Storage and Ownership
- Responsible Authorship and Publications – Peer Review
- Human Subjects Research and IRBs
- Animal Use and Care – Laboratory Safety and Responsibilities
- Mentor/Mentee Relationships
- Conflict of Interest – Personal, Professional, and Financial
- Research and Scholarship in Society and in the Global Workplace

Each module involved a one-hour, small group face-to-face discussion with lecture. Approximately 25 participants were in each group. These sessions were facilitated by 98 tenured and tenure-track faculty from each of the five departments in SPH (96% faculty participation). Out of the 565 students and postdoctoral fellows expected to participate in RCRS training, 424 (75%) completed, 53 (9.4%) attempted, and 88 (15.6%) did not attempt to do any training.

The SPH Research Council and deans have determined that all incoming SPH master’s students (M.P.H., M.H.S.A, and M.S.), Ph.D. students, and postdoctoral fellows will be trained in RCRS. Each department in SPH will be responsible for identifying trainees in need of RCRS training. Students and postdoctoral fellows who did not complete RCRS during the 2011-2012 academic year are expected to complete their RCRS training this coming year.

In the 2012-2013 academic year every student and postdoctoral fellow will now be required to attend SPH RCRS training as a graduation or employment requirement. It is expected that all participants will
complete all eight of the one-hour modules during their first two semesters in residence. RCRS training will be offered through one school-wide course, spanning all five departments that comprise SPH (Biostatistics, Epidemiology, Environmental Health Sciences, Health Management and Policy, and Health Behavior and Health Education). RCRS training is not a credit-bearing course but it is now a graduation requirement for all students.

SPH will offer RCRS training in the fall and winter terms. There will not be any offerings in the spring or summer terms. As in the past year the content will include the eight required core subject topics noted in the NIH Update on the Requirement for Instruction in the Responsible Conduct of Research (NOT-OD-10-019).

The format of RCRS training will involve sections that consist of approximately 25 students each and will be a combination of lectures and face-to-face discussion sections led by faculty. Each section will undertake eight session of one hour each. These will be offered by regular, tenure-track faculty selected from each of the five departments in SPH. SPH plans to offer a total of 22-24 sections in the fall and winter terms, which will meet at different times and frequencies for student convenience. Reading materials, PowerPoint slides, and lecture notes will be posted online via C-Tools.

Public Policy

Because the School typically does not have students or postdoctoral fellows funded by NSF or NIH grants, the plan essentially is to make certain training is received elsewhere if they do have funding from those institutions. The doctoral program is a Rackham IDP program, joint with three LSA departments. The plan is to leverage the opportunities for training that are being implemented by social sciences in the college. Students would participate in these activities with no cost to the Ford School, as the current implementation plan is through a one-credit course. This has been agreed to in principle with Associate Dean Juster. The school is seeking similar partnerships to allow postdoctoral fellows to participate in RCRS training elsewhere at U-M. Postdoctoral fellows at the school may be from the fields of education, engineering, social sciences, natural sciences, public health, and social work. Leadership at ISR and the school in principle feel this could be accommodated within their training structure.

The School did not have any in the last year who required RCRS training.

Social Work

With the cooperation of faculty and the Registrar’s Office, the School identified those on NSF and NIH funding. Participants completed a four-hour workshop taught by the Associate Dean for Research that included a didactic, classroom component. The workshop was offered two times each in the fall, winter, and spring/summer terms. All participants completed the PEERRS certification prior to the workshop to allow for a richer discussion using topics from the PEERRS modules. In addition, as part of the workshop each participant was asked to design their own case study on the conduct of human subjects’ research and RCRS. A C-Tools site was used to distribute and manage instructional materials. Content focused on core topics including:

- Appropriate citation of sources and avoiding plagiarism
- Authorship and publication practices and responsibilities
- Acquisition, management, ownership and sharing of data
- Research misconduct, including data fabrication and falsification
- Personal, professional, and financial conflicts of interest
- Supervisory and mentoring relationships and responsibilities
- Protection of human beings when research involves human subjects

Participants went on to complete an additional four hours of individualized training tailored to their specific research interests. This included discussions with their research mentors, some of whom are Social Work faculty but others are found in units such as Psychology, Psychiatry, and Economics. This past year 20 individuals completed the RCRS training offered by the school. Of these, two were postdoctoral fellows (one from Nursing and one from the school); 17 were doctoral students in the Joint Doctoral Program in Social Work and Social Sciences, and one was a doctoral student from the School of Education. An additional doctoral student in the Social Work-Social Science program completed the training with the Psychology Department. As far as the number of faculty involved, a total of 14 were involved: nine were from the School and five from other disciplines (Sociology, Psychology and Psychiatry).

The School is only requiring students funded by NIH or NSF to take the eight-hour RCRS training offered by the school. All of the NIH and NSF funded students have completed the training with perhaps one exception.

The School will continue with this same format in 2012-2013. However, the Associate Dean for Research will discuss with the Doctoral Program Advisory Committee whether it should be mandatory for all their doctoral students (independent of funding) to complete the RCRS training program and if so, whether to continue with the present approach or shift to a course format.
Do U.S. Research Institutions Meet or Exceed Federal Mandates for Instruction in Responsible Conduct of Research? A National Survey

David B. Resnik, JD, PhD, and Gregg E. Dinse, ScD

Abstract

Purpose
To explore the extent to which U.S. research institutions are meeting or exceeding National Institutes of Health and National Science Foundation mandates to provide instruction in responsible conduct of research (RCR).

Method
In summer 2011, the authors sent an e-mail survey to officials responsible for overseeing RCR instructional programs at the 200 top-funded research institutions in the United States and Puerto Rico. They cross-classified the proportions exceeding federal mandates by the types of additional individuals required to receive training and by medical school presence/absence.

Results
Responses were received from 144 institutions (72%); all had an RCR program. Of these 144 institutions, 69 (47.9%) required only federally mandated individuals to take RCR training, whereas 75 (52.1%) required additional individuals to be trained as well. A greater proportion of institutions with medical schools (62.3%; 53/85) went beyond the federal mandates than did those without (37.3%; 22/59). Types of additional individuals required to receive training included all students in selected programs (23.6%; 34/144), all students participating in externally funded research (12.5%; 18/144), all graduate students (11.1%; 16/144), all faculty/staff participating in externally funded research (9.7%; 14/144), all postdoctoral students or fellows (8.3%; 12/144), all doctoral-level students (4.9%; 7/144), all faculty/staff involved in human subjects research (4.9%; 7/144), and all faculty/staff involved in animal research (2.1%; 3/144).

Conclusions
More institutions with medical schools exceeded federal RCR training mandates than did those without. The authors encourage other institutions to expand their RCR requirements to promote research integrity.

Integrity is an essential aspect of the conduct of research in biomedicine and other scientific disciplines. Publication, peer review, collaboration, mentoring, data sharing, research with human and animal subjects, and other scientific activities rely on adherence to ethical standards. Unethical behavior may have detrimental consequences for science and for society, such as corruption of the research record, harm to public health or the environment resulting from regulatory or policy decisions based on faulty evidence, erosion of public support for research, and even threats to national security.  

In the late 1980s and early 1990s, a growing awareness of ethical problems, such as data fabrication and falsification, plagiarism, and conflicts of interest, led U.S. government agencies to take steps to promote integrity in federally funded scientific research. These efforts included formulating policies on research misconduct and conflict of interest, investigating cases of misconduct, and promoting research, education, and training in the responsible conduct of research (RCR).  

In 1989, the National Institutes of Health (NIH) implemented requirements for instruction in RCR for graduate students supported by NIH training grants. The NIH has revised these mandates several times since then and now requires that all students, trainees, fellows, and scholars supported by training grants, career development awards, research education grants, or dissertation research grants receive RCR training through the institutions with which they are affiliated.  

The NIH strongly encourages in-person instruction, recommending “a combination of didactic and small-group discussions,” which can be complemented by online training.  

(Per NIH policy, online-only training is not acceptable.) To meet NIH requirements, RCR training programs should include at least eight contact-hours of instruction in specific core content areas, including misconduct, data management, authorship, mentoring, collaboration, publication, peer review, and social responsibility.  

In 2001, the NIH extended its RCR training requirements to cover all intramural scientists, trainees, students, and staff who are substantially involved in research. These individuals must participate in initial online training and annual, in-person updates.  

Recently, the scope of federal RCR training mandates expanded to include research funded by the National Science Foundation (NSF). In 2007, the U.S. Congress passed the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act (the America COMPETES Act). Section 7009 of the act requires...
that any institution receiving NSF funds must have a plan to provide training on the responsible and ethical conduct of research to undergraduate students, graduate students, and postdoctoral researchers supported by those funds.\textsuperscript{3} The NSF implemented Section 7009 in August 2009, requiring institutions to certify in their funding applications that they have such a plan and, if funding is received, to verify that the appropriate students and postdoctoral researchers receive RCR instruction.\textsuperscript{4} The NSF does not specify the content or format of the training.

Now that two major federal research funding organizations require instruction in RCR for funded students and trainees, it is important to understand whether U.S. research institutions are meeting—or exceeding—these mandates. This is a crucial issue: Many experts agree that extensive institutional support for RCR education throughout the undergraduate and graduate curricula is necessary to promote integrity in research and to build an ethical culture within an institution.\textsuperscript{5–9} To examine this, we surveyed top-funded research institutions to capture a snapshot of current RCR training programs. We determined whether RCR training requirements go beyond those of the NIH and NSF and, if so, whom the institutions require to receive RCR training. We also explored whether the types of individuals required to receive RCR training differed between institutions with and without medical schools.

**Method**

**Data collection**

During May to June 2011, we sent a brief e-mail survey to officials responsible for overseeing RCR training at the 200 top-funded research institutions in the United States and Puerto Rico. We compiled the list of institutions using the latest data then available (from 2007) from the Center for Measuring University Performance (CMUP) at Arizona State University, a program that collects and analyzes data on U.S. universities.\textsuperscript{10} We searched these institutions’ Web sites using the terms responsible conduct of research, research integrity, research ethics, and research compliance until we found an appropriate contact person. In some cases, the Web site identified the person responsible for overseeing RCR training; in other cases, we were referred to that person by the individual we initially contacted. People responsible for overseeing RCR training included faculty members, research compliance officials, research integrity officers, and high-level administrators (e.g., vice president for research).

We kept the survey brief to help promote a high response rate, and asked recipients to reply by e-mail. Our survey invitation assured respondents that their responses would be kept confidential and that we would not publish responses identifying specific institutions, although we might publish a list of responding institutions (available from the authors). The survey consisted of the following five questions:

1. Does the institution have an RCR training program?
2. Who is required to take RCR training?
3. Is training centralized (e.g., handled by the office of research or graduate school), decentralized (e.g., handled by various colleges or departments), or both?
4. Is training online, in-person (e.g., classes or workshops), or both?
5. If training is available online, which online resource is used (e.g., the Collaborative Institutional Training Initiative or CITI)?

Regarding the last question, CITI is an online ethics training program, operated by the University of Miami, which provides training in RCR as well as in the protection of human and animal subjects and biosafety.\textsuperscript{11}

We sent a reminder e-mail after one week if no response was received, and we sent a second reminder after two weeks. In the few cases in which more than one individual at an institution responded to our request for information, we combined the responses and resolved minor discrepancies by giving preference to the response from the institutional official most directly responsible for overseeing the training program.

We obtained information on each institution’s funding (amount and ranking) and control (private versus public) from the CMUP. We classified each institution as having or not having a medical school and as belonging to one of four geographic regions according to U.S. census categories (i.e., Northeast, South, Midwest, and West). We counted an institution as having a medical school if it was a university with an associated medical school (e.g., Johns Hopkins University) or it was a medical school or an academic medical center listed separately by the CMUP (e.g., Baylor College of Medicine). We did not combine data for universities and associated medical schools that were listed separately by the CMUP.

The NIH Office of Human Subjects Research Protections determined that the federal human research protections regulations did not apply to this study because the study did not gather private information on human subjects.

**Data coding and analysis**

The first author (D.B.R.) coded the survey responses twice. Initially, he coded the data while developing the coding framework. Later, he coded the data a second time (in a blinded fashion), resolved differences between the codings by comparing them with the e-mail responses, and made further refinements to the coding framework.

We used the answers we received to the open-ended survey question “Who is required to take RCR training?” to develop the following nine dichotomous (yes/no) categories for classifying responses: (1) only individuals mandated by federal requirements (NIH/NSF), (2) all graduate students, (3) all doctoral-level students, (4) all students in selected programs (e.g., engineering, biomedicine), (5) all postdoctoral students or fellows, (6) all students participating in externally funded research, (7) all faculty/staff participating in externally funded research, (8) all faculty/staff participating in human subjects research, and (9) all faculty/staff participating in animal research. We used categories 2 to 9 to describe additional types of individuals some institutions required to take RCR training; those institutions also required training for persons mandated by the NIH and/or NSF.

We calculated the proportion of institutions with an RCR training program and the proportion that...
required individuals in each category to be trained in RCR. We also calculated the proportions of institutions with and without medical schools that required each category of individuals to receive RCR training. Finally, we tabulated the proportion of institutions with certain training types (e.g., centralized training, in-person training, online training, online training using CITI).

We used SAS version 9.2 (SAS Institute, Cary, North Carolina, USA) to perform statistical analyses. For each of the nine dichotomies, we applied Fisher’s exact test to assess whether the proportion of institutions with those training requirements differed according to whether an institution had a medical school and whether an institution was privately or publicly controlled. We also applied a two-sample t test, separately for each dichotomy, to assess whether institutions that did or did not require certain individuals to receive training differed with respect to their research funding. We checked the results obtained from the Fisher exact tests and t tests by using multiple logistic regression to simultaneously assess the effects of all explanatory factors considered together, as some factors may be correlated with others. All tests were performed at the α = .05 significance level.

Results

We received responses from individuals responsible for RCR training at 144 (72.0%) of the 200 institutions we contacted. These responses indicated that all 144 institutions (100%) had an RCR training program.

This suggestion of complete RCR training compliance is reasonable if the 144 responding institutions are representative of all 200 institutions from which we solicited information. However, if nonrespondents were less likely than respondents to have an RCR program, we would expect the proportion of institutions offering RCR training to be lower, possibly as low as 72% (144/200). To investigate this, we compared the known institutional factors of survey respondents and nonrespondents (data not shown). We found no statistically significant differences in medical school status, private/public status, or geographic region; however, respondents’ average funding level was higher than nonrespondents’ ($253 million versus $183 million; P = .017). We do not think that funding differences biased our results, and the remaining analyses restrict attention to the 144 responding institutions.

Among the 144 responding institutions, the average amount of research funding was $253 million, with a standard deviation of $233 million. The median funding was $186 million, with a range of $36 million to more than $1.5 billion. Eighty-five (59.0%) of the responding institutions had a medical school, and 110 (76.4%) were publicly controlled (Table 1). Ninety (62.5%) of the institutions offered both centralized and decentralized RCR training, and 121 (84.0%) offered a mix of in-person and online training. Of the 129 (89.6%) that offered online training, 95 (73.6%) used only CITI for that training. Table 1 provides additional details on training as well as geographic distribution.

RCR training requirements varied substantially across the 144 responding institutions: 69 (47.9%) of the institutions required RCR training only for individuals covered by federal mandates, whereas the other 75 (52.1%) required training for additional individuals as well. Institutions’ additional training requirements varied according to the category of individuals, $\alpha \neq .05$ significance level.

### Table 1

<table>
<thead>
<tr>
<th>Descriptive variable</th>
<th>Institutions</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Has an RCR training program (n = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>144</td>
<td>(100)</td>
</tr>
<tr>
<td>No</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Has a medical school (n = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>85</td>
<td>(59.0)</td>
</tr>
<tr>
<td>No</td>
<td>59</td>
<td>(41.0)</td>
</tr>
<tr>
<td><strong>Institutional control (n = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>34</td>
<td>(23.6)</td>
</tr>
<tr>
<td>Public</td>
<td>110</td>
<td>(76.4)</td>
</tr>
<tr>
<td><strong>Location by U.S. census region (n = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest</td>
<td>28</td>
<td>(19.4)</td>
</tr>
<tr>
<td>Northeast</td>
<td>72</td>
<td>(22.2)</td>
</tr>
<tr>
<td>South</td>
<td>54</td>
<td>(37.5)</td>
</tr>
<tr>
<td>West</td>
<td>30</td>
<td>(20.8)</td>
</tr>
<tr>
<td><strong>Training centralization (n = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centralized only</td>
<td>43</td>
<td>(29.9)</td>
</tr>
<tr>
<td>Decentralized only</td>
<td>11</td>
<td>(7.6)</td>
</tr>
<tr>
<td>Both</td>
<td>90</td>
<td>(62.5)</td>
</tr>
<tr>
<td><strong>Instruction method (n = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-person only</td>
<td>15</td>
<td>(10.4)</td>
</tr>
<tr>
<td>Online only</td>
<td>8</td>
<td>(5.6)</td>
</tr>
<tr>
<td>Both</td>
<td>121</td>
<td>(84.0)</td>
</tr>
<tr>
<td><em><em>Source of online training</em> (n = 129)</em>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CITI only</td>
<td>95</td>
<td>(73.6)</td>
</tr>
<tr>
<td>Own only</td>
<td>18</td>
<td>(14.0)</td>
</tr>
<tr>
<td>CITI* and own</td>
<td>15</td>
<td>(11.6)</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>(0.8)</td>
</tr>
</tbody>
</table>

*These results are restricted to the 129 institutions offering online training.
† Collaborative Institutional Training Initiative; see reference 11.
Table 2
Types of Individuals Required to Receive Responsible Conduct of Research (RCR) Training at 144 U.S. Research Institutions, 2011 Survey

<table>
<thead>
<tr>
<th>RCR requirement category*</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. (% of 144)</td>
</tr>
<tr>
<td>Only individuals mandated by federal requirements (NIH/NSF)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>69 (47.9)</td>
</tr>
<tr>
<td>No†</td>
<td>75 (52.1)</td>
</tr>
<tr>
<td>All graduate students</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16 (11.1)</td>
</tr>
<tr>
<td>No</td>
<td>128 (88.9)</td>
</tr>
<tr>
<td>All doctoral-level students</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 (4.9)</td>
</tr>
<tr>
<td>No</td>
<td>137 (95.1)</td>
</tr>
<tr>
<td>All students in selected programs</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>34 (23.6)</td>
</tr>
<tr>
<td>No</td>
<td>110 (76.4)</td>
</tr>
<tr>
<td>All postdoctoral students or fellows</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>12 (8.3)</td>
</tr>
<tr>
<td>No</td>
<td>132 (91.7)</td>
</tr>
<tr>
<td>All students participating in externally funded research</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>18 (12.5)</td>
</tr>
<tr>
<td>No</td>
<td>126 (87.5)</td>
</tr>
<tr>
<td>All faculty/staff participating in externally funded research</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14 (9.7)</td>
</tr>
<tr>
<td>No</td>
<td>130 (90.3)</td>
</tr>
<tr>
<td>All faculty/staff participating in human subjects research</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 (4.9)</td>
</tr>
<tr>
<td>No</td>
<td>137 (95.1)</td>
</tr>
<tr>
<td>All faculty/staff participating in animal research</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3 (2.1)</td>
</tr>
<tr>
<td>No</td>
<td>141 (97.9)</td>
</tr>
</tbody>
</table>

*The authors developed nine dichotomous categories to describe types of individuals required to take RCR training based on coding of responses to the survey question “Who must take RCR training?” All institutions required RCR training of individuals mandated by the National Institutes of Health (NIH) and/or the National Science Foundation (NSF).
†Institutions classified as “No” in this category had training requirements that met but were not limited to National Institutes of Health (NIH) and/or National Science Foundation (NSF) requirements.

Ranging from a high of 34 (23.6%) requiring instruction for all students in selected programs (e.g., engineering, bio medicine) to a low of 3 (2.1%) requiring instruction for all faculty/staff participating in animal research. Table 2 provides a breakdown of requirements for all nine categories.

Training requirements differed according to medical school status: ranging from a high of 34 (23.6%) requiring instruction for all students in selected programs (e.g., engineering, bio medicine) to a low of 3 (2.1%) requiring instruction for all faculty/staff participating in animal research. Table 2 provides a breakdown of requirements for all nine categories.

With a medical school were significantly more likely than those without to require RCR training for all doctoral-level students ($P = .042$), all students in selected programs ($P = .027$), and all faculty/staff participating in human subjects research ($P = .042$). RCR training requirements of privately and publicly controlled institutions did not differ significantly for any of the nine dichotomies, nor were there any significant differences in funding level (or rank) between the two categories associated with any of the nine training requirement dichotomies (data not shown). These results regarding medical school status, institutional control, and funding were based on applying t-tests and Fisher exact tests to each of those factors individually, but we reached the same conclusions when using logistic regression to assess all three factors simultaneously whenever such an analysis was possible (data not shown). The fact that no institutions without medical schools required RCR training of all doctoral-level students, all faculty/staff participating in human subjects research, or all faculty/staff participating in animal research prevented the use of logistic regression analysis for these three dichotomies.

Discussion
The most important finding of this study is that more than half of the research institutions in our sample required RCR training for individuals not mandated by the NIH or the NSF to receive such training. Although this is encouraging, perhaps more institutions should consider going beyond the federal mandates. In our opinion, requiring RCR training only for students and trainees supported by NIH or NSF grants may send a mixed message: If students are doing the same type of research, why should only those supported by such a grant be required to receive RCR training? We believe it would make more sense for institutions to broaden their training requirements to send a clear signal to students and faculty concerning the importance of the ethical conduct of research. There is also a practical advantage to going beyond federal mandates: It may be easier to track compliance by requiring all students and trainees of certain types to take RCR training rather than determining on a case-by-case basis whether particular
### Table 3
Proportions of 144 U.S. Research Institutions Requiring Certain Types of Individuals to Receive Responsible Conduct of Research (RCR) Training by Medical School Status, 2011 Survey

<table>
<thead>
<tr>
<th>RCR requirement category*</th>
<th>Institutions with a medical school</th>
<th>Institutions without a medical school</th>
<th>( P ) value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only individuals mandated by federal requirements (NIH/NSF)</td>
<td>32 (37.7)</td>
<td>37 (62.7)</td>
<td>.004</td>
</tr>
<tr>
<td>All graduate students</td>
<td>11 (12.9)</td>
<td>5 (8.5)</td>
<td>.591</td>
</tr>
<tr>
<td>All doctoral-level students</td>
<td>7 (8.2)</td>
<td>0 (0)</td>
<td>.042</td>
</tr>
<tr>
<td>All students in selected programs</td>
<td>26 (30.6)</td>
<td>8 (13.6)</td>
<td>.027</td>
</tr>
<tr>
<td>All postdoctoral students or fellows</td>
<td>9 (10.6)</td>
<td>3 (5.1)</td>
<td>.360</td>
</tr>
<tr>
<td>All students participating in externally funded research</td>
<td>7 (8.2)</td>
<td>11 (18.6)</td>
<td>.076</td>
</tr>
<tr>
<td>All faculty/staff participating in externally funded research</td>
<td>7 (8.2)</td>
<td>7 (11.9)</td>
<td>.570</td>
</tr>
<tr>
<td>All faculty/staff participating in human subjects research</td>
<td>7 (8.2)</td>
<td>0 (0)</td>
<td>.042</td>
</tr>
<tr>
<td>All faculty/staff participating in animal research</td>
<td>3 (3.5)</td>
<td>0 (0)</td>
<td>.269</td>
</tr>
</tbody>
</table>

*The authors developed nine dichotomous categories to describe types of individuals required to take RCR training based on coding of responses to the survey question “Who must take RCR training?” All institutions required RCR training of individuals mandated by the National Institutes of Health (NIH) and/or the National Science Foundation (NSF).

† \( P \) value associated with Fisher’s exact test of the null hypothesis that institutions with and without a medical school require the same proportion of individuals to be trained.

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individuals are funded by an NIH or NSF grant and therefore need instruction in RCR.

Another important finding is that a significantly higher proportion of institutions with a medical school than those without had RCR training requirements that went beyond the federal mandates. A possible explanation for this difference is that institutions with a medical school may have more experience in dealing with RCR training requirements. They may be more likely to have funding from the NIH, which has required RCR training since 1989; the NSF only started to require such training in 2009. Over the years, institutions with medical schools may have decided to expand their training requirements to include entire classifications of students: Our findings suggest that a higher proportion of these institutions than of those without a medical school require RCR training for students in specific programs (e.g., biomedicine).

An interesting finding is that there was substantial variation with regard to expanded RCR training requirements, suggesting that institutions’ philosophies about RCR instruction differ: Some focus on graduate or postdoctoral students, whereas others target students in specific programs or even faculty/staff involved in specific types of research (e.g., human subjects or animal research). This variation may change over time as institutions expand their RCR training programs and learn from their experiences with RCR instruction.

Limitations

Our study had several limitations. We did not ask in-depth questions concerning the content of RCR programs, the qualifications of the instructors, the use of case studies or videos, difficulties with implementing RCR programs (e.g., funding or staffing needs), institutional rationales for implementing additional training requirements, the evolution of institutional policies in response to federal mandates, or trainees’ perceptions of RCR instruction. Although collecting such information would be useful, our goal was to take a snapshot of current RCR instructional programs in the United States, which we accomplished by designing a brief survey to promote a high response rate. Our analysis was exploratory and descriptive; we did not attempt to formally evaluate RCR programs to determine how well they were meeting federal mandates. In the future, other researchers may be interested in conducting more detailed, follow-up surveys.

In addition, respondents at some of the institutions may not have provided accurate or truthful responses, out of fear that noncompliance might be reported to the NIH or NSF. For example, respondents at institutions receiving NIH funding may have been hesitant to admit that only online training was offered, because the NIH requires in-person training. Although the veracity of responses is a potential limitation, we do not think it is a significant one. First, we assured the individuals we contacted that their responses would be confidential and that we would not publish data pertaining to specific institutions. Second, many of the individuals we contacted indicated that they would be interested in the results of our study because they believed the information could be useful in further developing their RCR programs. This suggests that respondents were motivated to give accurate and truthful answers.

Conclusion

In conclusion, more than half of the research institutions responding to our survey have chosen to go beyond the federal mandates and require RCR training for individuals not specifically mandated by NIH or NSF to receive such instruction. We found that institutions with a medical school were more likely than those without to have training requirements that exceed federal mandates. Although these findings are encouraging, we believe that more research institutions should broaden their
RCR training requirements to promote integrity in education and research.

Acknowledgments: The authors wish to thank Grace Kissling, Bill Schrader, and Bruce Androphy for helpful comments.

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Other disclosures: None.

Ethical approval: Not applicable: This research did not involve human subjects, as determined by the NIH Office of Human Subjects Research Protections.

Disclaimer: The statements, opinions, or conclusions contained herein do not necessarily represent the statements, opinions, or conclusions of NIEHS, NIH, or the United States government.

References