



**PLAN TO MEET THE NATIONAL SCIENCE FOUNDATION'S EDUCATIONAL
REQUIREMENTS FOR TRAINING AND OVERSIGHT IN THE RESPONSIBLE
AND ETHICAL CONDUCT OF RESEARCH**

Developed by the UCR Office of Research

December 2009

BACKGROUND

Section 7009 of the America COMPETES Act of 2007 (*America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education and Science*) directed that the National Science Foundation require that each institution that applies for financial assistance from the Foundation for science and engineering research or education certify that the institution has a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students, and postdoctoral researchers who will be supported by NSF. While training plans are not required to be included in proposals submitted to NSF, institutions are advised that they are subject to review upon request.

In responding to this requirement, the NSF published a revision to its *NSF Proposal & Award Policies and Procedures Guide* requiring that beginning January 4, 2010, institutions must certify that, at the time of proposal submission, the institution has a plan to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students, and postdoctoral researchers who are supported by NSF.

PURPOSE

The purpose of this document is to outline a plan at UCR for implementing NSF's requirements for providing training to undergraduate and graduate students and postdoctoral researchers in the responsible and ethical conduct of research. This plan is intended to satisfy *minimum baseline requirements* of Section 7009 of the America COMPETES Act of 2007 so Departments, Programs and Principal Investigators are strongly encouraged to provide training that goes beyond the minimum requirements, such as seminars, workshops, and curriculum.

POLICY STATEMENT

All University of California Riverside (UCR) undergraduate and graduate students as well as postdoctoral researchers who participate in NSF funded research or educational projects must fulfill educational requirements related to the responsible and ethical conduct of research.

All members of the UCR research community, to include students and postdoctoral researchers, are expected to adhere to the highest ethical and professional standards as they pursue research and scholarly activities. Maintaining this standard requires the vigilance of all participants engaged in research and scholarly endeavors to comply with the legal, regulatory, and ethical requirements established by the University, regulatory agencies, funding sources and professional organizations.

The Office of Research Integrity (ORI) in the U.S. Department of Health and Human Services is the federal agency charged with the responsibility of oversight for the responsible conduct of research (RCR). The ORI encourages researchers to make a special effort to understand, discuss, and teach others about the responsible conduct of research. It is understood that RCR can be taught and learned in many ways and that standards can vary from discipline to discipline. The ORI has an excellent text that discusses the essential aspects of an RCR program (1), available free for your use and dissemination. For this reason, it is the intent of the RCR Education Program at UCR to provide flexibility in its content and delivery modes in such a way that it addresses the specific needs, issues and concerns of various target audiences across numerous disciplines.

RESPONSIBLE CONDUCT of RESEARCH (RCR) CONTENT AREAS

In several presentations, NSF has indicated the following content areas could be included in responsible conduct of research education:

- **Data Acquisition, Management, Sharing and Ownership**
- **Publication Practices and Responsible Authorship**
- **Mentor/Trainee Responsibilities**
- **Peer Review**
- **Collaborative Research**
- **Time Management and Personal Responsibility**
- **Research Misconduct**
- **Conflict of Interest and Commitment**
- **Whistleblowing**
- **Dispute Resolution**
- **You and the Literature**
- **Lab Note Books and Graphical Presentation of Data**
- **Data Ownership and Inventions**
- **Posters and Oral Presentations**
- **Attending Scientific Meetings**

- **Writing Grant Proposals/Obtaining Funding**
- **Writing a Research Article**
- **Peer Review, Problem Selection and Problem solving**
- **Legal Issues in Research and Research Misconduct**
- **Teaching Skills**
- **Job Skills and Life After Grad School and Postdoc Appointments**

CONSIDERATIONS IN DEVELOPING THE PLAN

In developing the plan for implementation the following considerations were determined to be relevant factors:

- What strategies will be used for implementation?
- What content and delivery methods will be used?
- Is there a need for content development or implementation of other pedagogical methods to meet requirements?
- Who will be responsible for the various components of the institutional RCR Education Program?
- What institutional policy, guidelines, and procedures will facilitate implementation of the plan?
- What resources are available to support implementation of the plan and are they sufficient?
- Who will provide institutional oversight and verification that requirements are met?
- How will completion of training be reported?
- How will the overall efficacy of the RCR education program be evaluated?

PLAN FOR IMPLEMENTATION

Goal: Implement a plan for compliance with NSF RCR training requirements at UCR

Requirement: NSF requires certification that the institution has developed a plan to provide training and oversight in the responsible conduct of research (RCR) at the time of proposal submission

Effective Date: January 4, 2010

Target Audience: Undergraduate and graduate students and post-doctoral researchers working on projects funded in whole or in part by NSF research and education grants. It includes visiting undergraduate and graduate students and post-doctoral researchers supported by institutional NSF awards, such as participants in Research Experiences for Undergraduates (REU) and Research Experiences for Teachers (RET) programs.

Delivery Methods

Various combinations and modes of instruction will be available for completion of training requirements to afford maximum flexibility in meeting the needs of a broad range of stakeholders. In this sense, the program will be customized and appropriate for the target audience. For example, the requirements for a post-doctoral researcher in engineering are different than those of an undergraduate student in psychology. The Office of Research, in consultation with the RCR Education Committee, will establish and communicate minimum training standards for each target audience (undergraduates, graduate students and post-doctoral researchers).

Mentoring activities conducted by supervisory faculty are expected to be the primary mechanism for providing instruction in RCR. Particularly with respect to post-doctoral researchers, mentoring may consist of informal or formal meetings to discuss topics related but not limited to: career counseling, training in the preparation of grant proposals, publication and presentations, improving teaching and mentoring skills, reconciling dual roles as mentor/mentee, effective collaboration with investigators from diverse backgrounds and disciplinary areas, implications of temporary appointments on data and project ownership, and responsible professional practices.

Mentorship in RCR will be augmented by the availability of web-based instructional modules as well as more formal methods of instruction such as credit or non-credit courses, seminars, workshops, lectures, etc.

Other Training Options: Principal Investigators may select a number of options to complete training requirements.

- A UCR-specific undergraduate RCR resource/information guide (RCR Primer) for all undergraduates who will be supported by NSF awards. This guide will provide the baseline training for undergraduates.
- For graduate students and postdoctoral researchers, on-line modules developed by the Collaborative Institutional Training Initiative (CITI). A certificate of completion is generated for each individual successfully completing the on-line training and reports of completion are generated by CITI to the Office of Research. CITI is designed to be discipline specific and may be fully customized for a particular research community (biomedical, social behavioral, physical sciences, and humanities). The CITI training will be available at UCR by June 2010, and it will be the responsibility of Principal Investigators to assure that their trainees take this training as soon as practical.

- Formal instruction. The Web-based training should be supplemented by formal instruction delivered in courses, workshops or seminars. The Office of Research will offer occasional workshops by subject matter experts in some of these different RCR areas. The UCR ORI will also maintain a roster of faculty and staff subject matter experts who can provide occasional classroom instruction in various segments of RCR upon request (see **RCR Resources** on the next page). Colleges, departments and centers are encouraged to offer decentralized training designed to meet the specific needs of the students or post-doctoral researchers assigned to projects under the supervision of their faculty. Graduate students and postdoctoral researchers will be expected to attend at least one such course, workshop or seminar annually after receiving the CITI certificate of completion.

Responsibilities under the Plan

Responsibility for compliance rests primarily with Principal Investigators. Accordingly, Principal Investigators will:

- Upon receipt of NSF funding, identify research team members that will require training in the responsible and ethical conduct of research.
- Schedule and monitor completion of RCR training for required students and post-doctoral researchers
- Keep a record of all training experiences (except for those through the Web-based CITI courses which will automatically record the completion of its courses).
- Engage in compacts with post-doctoral appointees that outline the commitments of both the PI and the post-doctoral appointee relative to the post-doctoral appointee-mentor relationship

The Office of Research Integrity (ORI) is the division within the UCR Office of Research responsible for:

- Designating an Authorized Organizational Representative who will certify the existence of an institutional plan for RCR education on NSF proposals;
- Monitoring training activities;
- Verifying compliance with NSF RCR training requirements; and
- Building collaborations with departments and that promote faculty involvement in the program.

The RCR Advisory Committee reporting to the Vice Chancellor for Research, is responsible for:

- Providing institutional leadership for implementing and evaluating the RCR Education Program;
- Assisting in the development and review of RCR educational resources;
- Serving as a liaison between the ORI and Colleges/ Departments/Centers for implementation and conduct of the RCR Education Program; and
- Recommending implementation of policies that promote the institutional goals of the RCR Education Program.

Institutional policy, guidelines and procedures

The development of institutional policy, guidelines and procedures relevant to RCR practices and the RCR Education Program underscores its legitimacy as an institutional priority and advances the responsible and ethical conduct of research within the UCR community.

RCR Resources

The UCR ORI will be responsible for developing RCR educational resources. Resources that will be made available include:

- Case studies. A catalog of case studies for use in formal instruction will be made available on the ORI RCR website.
- RCR training on demand. ORI will maintain a roster of faculty and staff subject matter experts who can provide occasional classroom instruction in various segments of RCR upon request.
- Centralized ORC RCR training. A series of occasional workshops based on case study review are planned.

Colleges, Departments and Research Centers are responsible for developing additional discipline-specific ethics and RCR training appropriate for each target audience. In so doing, the following should be considered:

Program Assessment

Overall efficacy of the RCR Education Program will be evaluated based on meeting the goals and objectives of the program outlined below. These goals are more practically focused on skill development rather than knowledge [as articulated in the National Academy of Engineering’s Summary of a *Workshop on Ethics Education and Scientific and Engineering Research* (2)]. The goals of the RCR Education Program are to:

- Serve as a catalyst for the questioning of decisions, practices and processes related to the responsible conduct of research with the objective of arriving at better informed decisions
- Promote skill development by:
 - Recognizing and defining ethical issues
 - Identifying relevant stakeholders and socio-technical systems
 - Collecting relevant data about stakeholders and systems
 - Understanding relevant stakeholder perspectives
 - Identifying value conflicts
 - Constructing viable alternative courses of action or solutions and identifying constraints
 - Assessing alternatives in terms of consequences, public defensibility, institutional barriers, etc.
 - Engaging in reasoned dialogue or negotiations
 - Revising options, plans or actions

This concept of skills development is consistent with the guidelines developed by the AAMC (Association of American Medical Colleges) concerning the student-mentor relationship as outlined in their *Compact Between Biomedical Graduate Students and Their Research Advisors* (3). This compact outlines core tenets of pre-doctoral training and includes the following:

- Institutional Commitment
- Program Commitment
- Quality Mentoring
- Provision of Skills Sets and Counseling that Support a Broad Range of Career Choices

These core tenets are supported in principal and practice by UCR through implementation of this plan. Although the AAMC document is intended for use by advisors and students within the biomedical community, its concepts have broad interdisciplinary application.

In addition to the compact that the AAMC developed for pre-doctoral students and their advisors, the AAMC also developed a *Compact Between Postdoctoral Appointees and Their Mentors* (4) which outlines similar tenets and includes:

- Institutional Commitment
- Quality Postdoctoral Training

- Importance of Mentoring in Postdoctoral Training
- Foster Breadth and Flexibility in Career Choices

The AAMC *Compact Between Postdoctoral Appointees and Their Mentors* underscores the importance and value of mentoring in postdoctoral training: “Effective mentoring is critical for postdoctoral training and requires that the primary mentor dedicate substantial time to ensure personal and professional development. A good mentor builds a relationship with the trainee that is characterized by mutual respect and understanding. Attributes of a good mentor include being approachable, available, and willing to share his/her knowledge; listening effectively; providing encouragement and constructive criticism; and offering expertise and guidance.” UCR supports this philosophy; it is the principle upon which program success will be measured.

Acknowledgement

This document is modeled on one generously shared with UCR by the Office of Research Compliance at Boston University.

References

- (1) Nicholas H. Steneck. U.S. Department of Health and Human Services Office of Research Integrity - Introduction to the Responsible Conduct of Research. (2007)
http://ori.dhhs.gov/publications/ori_intro_text.shtml
- (2) Workshop on Ethics Education and Scientific and Engineering Research. (2009).
http://www.nap.edu/catalog.php?record_id=12695
- (3) AAMC Compact Between Biomedical Graduate Students and Their Research Advisors. (2008) <http://www.aamc.org/research/gradcompact/>
- (4) AAMC Compact Between Postdoctoral Appointees and Their Mentors. (2006)
<http://www.aamc.org/research/postdoccompact/start.htm>