

# Research Ethics Education in Graduate International Collaborations

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Suggested citation:

Caramello, C., Denecke, D., & Feaster, K. (2017). *Research Ethics Education in Graduate International Collaborations*. Washington, DC: Council of Graduate Schools.

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This publication is based upon work supported by the National Science Foundation under Grant No. 1135345. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the National Science Foundation.

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ISBN-10 1-933042-48-6

ISBN-13 978193304280

Printed in the United States.

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# Foreword

Today's STEM faculty researchers, PhD candidates, and research master's students work in an international profession and live in a global society. Graduate students from the U.S. are studying and engaging in collaborative research abroad in increasing numbers, just as graduate students from abroad are studying and conducting research in the U.S. in increasing numbers.

These students, in order to succeed, must learn the institutional regulations and compliance standards that apply in the countries where they are visitors, and they must learn the professional expectations, research protocols, and ethical standards of those countries. Maybe most important, they must develop skills in ethical reasoning that will allow them to respond to situations that may arise in international study or research collaboration.

With grant support from the National Science Foundation (#1135345), the Council of Graduate Schools initiated a three-year project in 2012 for the development of educational programs designed to help domestic and international students gain knowledge and skills in research ethics in international contexts. The programs would fill a need and an educational gap by integrating international issues into research ethics programs and integrating research ethics education into international collaborations.

The project joined two areas of great interest to CGS and its member institutions: 1) RCR and scholarly integrity, and 2) international collaboration. CGS and the participating universities—Emory University, Northern Arizona University, University of Oklahoma, and Virginia Polytechnic Institute and State University—built on a number of earlier projects in those two areas when developing the educational programs that resulted from this project.

The following monograph, *Research Ethics Education for Graduate International Collaborations*, discusses the project as a whole, as well as its individual programs. The programs are offered as “models” that have been tested through outcomes assessment and proven effective. I hope that they will inform your efforts to shape educational programs in international research ethics, and I invite you to share this CGS report with administrative and faculty colleagues and graduate researchers.

Suzanne Ortega  
President  
Council of Graduate Schools

# Acknowledgments

Every CGS Best Practice initiative depends upon the leadership and vision of graduate deans and others at participating universities. CGS would first like to thank those deans who served as principal investigators and their colleagues who served as co-PI's or project directors on the rich and diverse university projects upon which this report is based: Karen DePauw, Nanda Gudderra, Cathryn Johnson, Ramona Mellott, Michael Mumford, Karen Rommelfanger, Toby Schonfeld, Lisa Tedesco, and Lee Williams. Each of these individuals worked with many colleagues on their campuses (including faculty, staff, postdocs, and graduate students) to carry out this important work. Their careful documentation of their experiences as well as dialogue with each other and feedback to CGS throughout the project was essential to shaping this report.

This report was also informed by the CGS framing paper, *Modeling Effective Research Ethics Education in Graduate International Collaborations: A Learning Outcomes Approach* (CGS 2012b), authored by Daniel Denecke and Julia Kent. CGS is grateful to the project advisory committee for their helpful comments on that paper and for their significant input into tools and guidelines that informed this project's approach to research ethics education and learning assessment. Advisory committee members were: Samuel Attoh, Rajendra Bordia, Nilssa Bosque-Perez, Diana Carlin, Andrew Comrie, James Dubois, Peter Ewell, Jeffery Gibeling, Elizabeth Heitman, Maxwell King, and Paul Tam.

CGS is also grateful to the National Science Foundation for grant support and to NSF program officers Earnestine Psalmonds-Easter and John Tsapogas, in particular, as well as to the many PI's from NSF-funded IGERT and PIRE programs for the helpful conversations that informed this project. Finally, CGS is also grateful to staff members Daniel Denecke and Julia Kent for providing project direction, Keonna Feaster who served as project manager, and CGS Dean-in-Residence Charles Caramello for taking the lead in authoring this report on project results.



# I. Introduction

*Scientists and engineers today work in a highly collaborative international environment.* That sentence captures, in a few succinct words, the basic premise behind the Council of Graduate Schools project detailed in the following monograph. The title, *Research Ethics Education for Graduate International Collaborations*, conveys the project's purpose.

Graduate students from the U.S. in science, technology, engineering, and mathematics (STEM) are studying abroad in growing numbers, both in formal degree programs and in informal research collaborations. STEM graduate students from abroad, reciprocally, are studying in the U.S. in growing numbers. By definition, both these groups of students work in multinational and multicultural settings. The same holds true for students who remain in their own countries but work in labs or on projects with international peers.<sup>1</sup>

Providing boundless opportunities, this multifaceted globalization of graduate study and research also presents many challenges. Not the least of them is the need for students to 1) learn the research protocols and professional standards of other nations and cultures, and 2) develop the skills in ethical reasoning necessary for navigating international research and study and responding appropriately to situations that may arise. Only through systematic training, such as that piloted in the CGS project and discussed in this monograph, can students gain the necessary knowledge and skills.

A basic challenge, however, is this: programs and other training initiatives in Responsible Conduct of Research (RCR) or research ethics typically do not cover in detail issues raised by RCR and research ethics in international contexts; conversely, joint international degree programs and international research collaborations typically do not include explicit attention to RCR or research ethics. CGS sought to bridge that gap.<sup>2</sup>

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<sup>1</sup> For purposes of this project, CGS defines *work in international contexts* as including formal joint and dual degree programs, study or field research abroad, research collaborations and exchanges, and research in internationally diverse labs or research projects.

<sup>2</sup> For purposes of this project, *responsible conduct of research (RCR)* refers broadly to ethical and responsible research in: data acquisition, management, sharing and ownership; conflict of interest and commitment; research on human subjects and animal welfare; avoidance of research misconduct; publication practices and responsible authorship; mentor/trainee responsibilities; and peer review. *Research ethics* refers to skills and abilities needed to make deliberate and sound decisions regarding ethical issues that commonly arise in research settings.

In 2012, CGS initiated a three-year project to address three specific needs: the preparation of STEM researchers to face the potential ethical challenges of international research collaborations; the preparation and training of students from international and intercultural backgrounds for study in U.S. STEM graduate programs; and the development of accessible and replicable models for those preparations—models that integrate international issues into general research ethics education and/or integrate research ethics education into international collaborations.

Addressing those three needs, particularly the third, necessitates *learning outcomes assessment*. Initiatives for incorporating international issues into research ethics education, or research ethics education into international programs and collaborations, demand rigorous and ongoing *assessment* of their desired learning outcomes to

- 1) measure effectiveness,
- 2) provide accountability,
- 3) inform and enable programmatic change, and
- 4) disseminate tested models.

Learning outcomes assessment, consequently, was integral to the CGS project and the institutional initiatives supported by it (CGS, 2012b).

The project brought together two areas of longstanding interest to CGS and its member institutions: RCR and scholarly integrity, on the one hand, and international collaboration, on the other. It built on projects such as *The Project for Scholarly Integrity* and *Best Practices in Graduate Education for the Responsible Conduct of Research* as well as a CGS prior project on graduate international collaborations and a CGS global summit on Research Ethics and Scholarly Integrity (CGS 2012; CGS 2009a; CGS 2010; CGS 2009b). Part II of the present monograph revisits those projects. Parts III and IV report on the work done for the 2012-15 project by the participating institutions—Emory University, Northern Arizona University, University of Oklahoma, and Virginia Polytechnic Institute and State University. Part V offers recommendations from CGS.

Scholarly integrity and international collaboration are independently critical to the ethical and intellectual health of advanced learning and research and, therefore, hold signal importance for national and international graduate institutions, organizations, and communities. They accrue even greater importance when taken together. Graduate schools, by virtue of their broad institutional perspectives, are well positioned to lead their universities in addressing these issues. The information and recommendations in this monograph are intended to help facilitate that leadership.

## II. Background

### A. History of the Project

Recent years have witnessed significant and positive developments in two seemingly unrelated areas in U.S. graduate education. First, a growing number of institutions have developed RCR or research ethics programs for graduate students, particularly students in STEM disciplines. Second, institutions are providing a growing number of U.S.-based graduate students in STEM fields with opportunities to participate in international degree programs or research collaborations abroad, while also providing a growing number of international STEM students with opportunities to pursue study or to conduct research in the U.S. It was time, clearly, to link these two areas.

The reasons are obvious. Researchers in an increasingly global scientific community need to know and meet professional expectations that vary across national and cultural contexts. These expectations pertain not only to governmental or institutional regulations and compliance standards, not only to data sharing, authorship, and other questions of intellectual property, but also to the many less formal and obvious social codes and mores, including the subtleties of professional etiquette, that face researchers working in new contexts. While many of these expectations, moreover, are “universal” across academic disciplines, many others are specific to individual disciplines.

Institutions, therefore, have an obligation to help U.S.-based students and researchers learn to deal effectively with standards of behavior and ethical issues they may face when participating in international educational programs or collaborative research projects. (This applies not only to domestic U.S. students, but also to international students enrolled in U.S. universities who may study or conduct research outside of the U.S., perhaps in a country not their own). Institutions, similarly, have an obligation to help international students learn to deal effectively with the policies, protocols, and practices of graduate study and research in the U.S., and to do so in a way that is unbiased, respectful, and attentive to difference.

As noted in the Introduction, however, institutions must overcome a double challenge to reach those goals: *programs and other training initiatives in RCR or research ethics typically do not cover in detail particular issues raised by RCR and research ethics in international contexts; conversely, formal joint international degree programs and informal international research collaborations typically do not include explicit attention to RCR or research ethics.* This applies to programs for U.S. students in international settings, as well as for international students in U.S. settings.

With grant support from the National Science Foundation, CGS launched a project in 2012 to bridge that gap. CGS invited institutions to submit proposals for educational models that would address issues of research ethics integrity encountered in STEM academic programs and research collaborations in two areas of priority: 1) issues faced by U.S. graduate students working in international academic programs or research settings, and 2) issues faced by international graduate students studying in U.S. institutions.

CGS asked institutions, in addition, to incorporate learning outcomes assessment into their proposed projects. The substantial body of scholarship on *learning outcomes assessment* emphasizes three main activities:

- 1) identifying and stating explicitly the knowledge, skills, and other competencies—whether generic or program- or discipline-specific—that a student is expected to have acquired in successfully completing a course, internship, dissertation, other curricular or co-curricular activity, or degree program as a whole;
- 2) developing metrics and templates or other tools for measuring and tracking student success in meeting the specified outcomes; and
- 3) using the collected data in a “feedback loop” to assess and improve program effectiveness. Learning outcomes assessment, in the case at hand, would produce objective information on the effectiveness of research ethics education for international settings.<sup>3</sup>

Designed to enhance the graduate community's understanding of the *effectiveness* of different approaches to *integrating international issues into research ethics programs* and *integrating research ethics education into international collaborations*, the CGS project sought to generate three types of resources: 1) “case studies” of model programs or initiatives that addressed either or both of those goals; 2) model but flexible sets of *learning outcomes* that identify appropriate knowledge, skills, and competencies, and of *assessment processes* that serve to evaluate and enhance graduate research ethics education; and 3) an online repository of appropriate outcomes and tools for assessing them.

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<sup>3</sup> Learning outcomes assessment has been well established for some time in undergraduate education. For overviews of its history and practices, see, e.g., Shavelson, 2007; Rhodes, 2010; and Kuh et al., 2014. Learning outcomes assessment in master's programs and professional doctoral programs is also fairly well established at this point, and is becoming increasingly common in doctoral education, though ideally with an emphasis on creating rather than learning knowledge. See, e.g., Lovitts, 2007; CGS, 2011, pp. 28-39. At the doctoral level, the conversation on outcomes assessment has become intertwined with the conversation on professional competencies. See, e.g., Lumina Foundation, 2016. In addition to the convening reported in that document, the Lumina Foundation and CGS also co-sponsored a meeting on Doctoral Education and Learning Outcomes Framework; the published findings are forthcoming.

## B. Previous CGS Projects in Research and Scholarly Integrity

The project discussed in this monograph builds on results and recommendations from four previous CGS projects, including two prior NSF-funded projects in the areas, separately, of research ethics and international collaborations; a multi-year project funded by the Office of Research Integrity (ORI)—the [Project for Scholarly Integrity \(PSI\)](#)—to develop multi-disciplinary graduate education programs in research ethics and integrity; and a Global Summit of university leaders convened by CGS in 2008, also on the topic of research ethics. These projects resulted in several CGS “best practice” guides.<sup>4</sup>

The projects helped CGS to identify challenges and opportunities subsequently addressed in the project under discussion in the present monograph. Data from the PSI, for example, indicate that programs and students diverge in their views of how students receive information on research and scholarly integrity. Programs tend to perceive this information as coming *from advisors and mentors*, more than from coursework, workshops, online and print materials, or other sources. Students, however, reported receiving this information more often from sources *other than their advisors and mentors*.<sup>5</sup> That gap in *perceptions* of research ethics training in general was exacerbated by a second gap in *availabilities* of research ethics training for international settings.

## C. A Missing Link in Current Research Ethics Programs

Despite progress in growth, general research ethics programs typically do not address the ethical and research integrity issues peculiar to international study and collaboration. CGS conversations with PIs on NSF-funded traineeships and international research partnership programs, university leaders in the CGS Global Summit series, and deans in PSI workshops and meetings, posited two possible reasons (among others): 1) federal and other national mandates for RCR training have informed much of the dialogue about training in research ethics, relegating issues peculiar to research in international settings to the periphery; 2) U.S. doctoral students automatically increase the claims on their time (and perhaps extend their time to degree), when they engage in international study or research collaborations, making them reluctant to attend additional workshops or events on research integrity.

Despite progress in programming, moreover, universities continue to struggle with the needs for research ethics training for international students studying in the U.S. Institutional leaders indicated, in prior CGS projects, that 1) they lack awareness of robust models or effective “best practices” for such training, and 2) they reject models or practices that stigmatize, or even appear to stigmatize, international students based on differing cultural backgrounds. Part III of this monograph includes some promising models that emerged from the CGS project. Whatever the case,

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<sup>4</sup> See CGS, 2006, 2009a, 2009b, 2010, and 2012a. See also <http://www.cgsnet.org/scholarly-integrity-and-responsible-conduct-research-rcr>.

<sup>5</sup> For analyses of PSI survey data and of discussions with STEM students and faculty on multiple campuses, see CGS, 2012.

programs for international students in the U.S.—like programs for U.S. students in international settings—clearly warrant fuller integration into graduate education as *fundamental elements of research training and professional development*, and, therefore, warrant comprehensive institutional approaches and commitments of resources.

## D. The Role of Graduate Schools in Research Ethics Programs

Graduate schools play a critical role in research ethics training, whatever their institution's configuration for research or graduate education may be.

Large research universities typically delegate responsibility for graduate education and research to two separate campus-level units. With respect to research ethics training, the unit for *graduate education* (generally a graduate school) likely focuses on often fluid professional standards, administering educational programming in research and scholarly ethics broadly conceived; the unit for *research* likely focuses on fairly rigid and externally imposed regulations, administering RCR and other compliance training required by federal agencies or other grantors. Comprehensive universities with some graduate and research activity more typically assign responsibility for graduate education and research to a single campus unit that, in turn, may reassign them to separate sub-units. Institutions where graduate education and sponsored research play a relatively small role likely assign the two functions to a compact campus unit or office that simply handles both.

Whatever the scale of graduate education and research, any institution benefits when its graduate school (or other responsible unit) collaborates closely with campus graduate programs and faculty on every aspect of graduate education—including international collaborations and research ethics training. Whatever the scale, moreover, a neutral, pragmatic, and supple concept of “distributed responsibility” for graduate education proves more productive and less divisive than the commonly used binary formulation of *centralized* versus *decentralized* responsibility. This concept of “distributed responsibility” adapts well to differing institutional cultures as well as to varying projects or initiatives.

Graduate schools, as noted in the Introduction, are positioned to lead their universities in research ethics education, offering some training programs themselves and coordinating other programs offered by departments or graduate degree programs. This model accommodates and generates research ethics education whose foci can range from the very broad and interdisciplinary to the very narrow and disciplinary, and whose formats can range from large audience lectures and presentations, “train-the-trainer” initiatives, and interactive websites, to dedicated discipline-specific courses, integration into existing courses, or in-lab activities. The model distributes responsibility for organization, implementation, and financial and personnel resources; strengthens campus integration and project sustainability; and ensures that students will gain both general skills and discipline-specific knowledge.

Such a hybrid model, moreover, provides balance. It takes advantage of a Graduate School's unique “big picture” perspective—one that encompasses national best practices and all campus programs. It also takes advantage of a graduate school's

administrative ability and responsibility for 1) bringing together multiple units and faculty with complementary areas of expertise in campus wide projects, and 2) ensuring overall and consistent *quality* across more localized projects that necessarily will differ from one another in *kind*. At the same time, a hybrid model draws on the individual graduate program's unique academic disciplinary perspective and expertise, as well as its "on-the-ground" administrative structure and processes and its knowledge of its students and their particular needs.

Everything said above about education in research ethics *in general* applies equally to education in research ethics *in international settings*, with an important addition. In the latter case, a Graduate School's partners are likely to include offices of international affairs (in addition to divisions of research and campus graduate programs) not only as research ethics education relates to international students enrolled in U.S. institutions, but also as it relates to U.S. students studying and conducting research abroad. Though typically oriented toward undergraduates, offices of international affairs have considerable expertise in the logistics and other dimensions of international student travel. Graduate Schools should consult these offices both in designing research ethics programs and in preparing individual students to work in particular national and cultural settings.

## E. The Place of Learning Outcomes Assessment

As noted earlier, *learning outcomes assessment* focuses on what students *know* and are able *to do* as outcomes of their experience in a course, internship, dissertation, other curricular or co-curricular activity, or program as a whole. Pedagogy based on teaching focuses on educational "inputs," while pedagogy based on learning focuses on "outputs." Measuring those "outputs"—or *learning outcomes assessment*—provides data on student and program performance that can serve to improve the "throughput" of the educational process. Such assessment, for example, could measure success in the two basic objectives of doctoral education: mastery of the discipline and its requisite research skills, and attainment of an appropriate level of professional development.

The graduate community at local, national, and international levels has debated the applicability of outcomes assessment to graduate education—particularly doctoral education. The debate has generated several major workshops and conferences and an emerging literature. Internationally, some national or provincial government agencies have mandated or endorsed assessment frameworks for doctoral education in public universities. As with many practices in U.S. graduate education, by contrast, neither federal nor state agencies have instituted or required outcomes assessment, but regional and other accreditation agencies have mandated them in their "standards of excellence." Academic opinion remains divided, but many academicians believe that doctoral outcomes assessment has legitimacy; benefits students, faculty, and programs; serves the graduate enterprise by providing accountability; and, for better or worse, is here to stay.

## Sample Learning Outcomes

CGS asked participating universities to develop outcomes for graduate student learning in research ethics for international collaborations—providing them with sample outcomes to help in their work. CGS developed these samples in close consultation with an international, multi-disciplinary Advisory Committee, comprising STEM researchers (including PIs on NSF-funded international research collaborations), national experts in learning outcomes assessment and research ethics, and university leaders with STEM backgrounds and with experience overseeing international research collaborations. The Committee provided extensive input on content, structure, presentation, and potential use.

The resulting matrix of sample outcomes presented in Table 1 below reflects a broad range of issues in research ethics and international collaborations: it coordinates three areas for study (cultural context, research practices, and ethical frameworks) with three types of learning outcomes (knowledge, skills, and professional attitudes). The sample outcomes were meant to apply to a broad range of STEM disciplines, not to apply to any specific field or fields of study. And they were meant to prompt the design and development of outcomes identified as important by individual graduate programs and initiatives, not to prescribe institutional approaches.

**Table 1. Sample Learning Outcomes for Research Ethics Education in International STEM Collaborations**

“By the time they complete their course of study, students should be able to/are expected to...”

	Knowledge	Skills	Professional Attitudes
Cultural Contexts	Describe several prominent theories of culture and cultural difference.	Situate him or herself in the context of various national cultures and communities.	Question common stereotypes about individuals and researchers from participating countries.
	Identify social, economic, and political factors that may affect research practices in different countries.	Consider various factors in assessing what is attributable to cultural differences and what are individual attributes.	Respect cultural differences and areas of cultural sensitivity.
	Compare structures of hierarchy and modes of communication in home and partner countries.	Seek information about differences in rules of professional etiquette and research practice.	Value self-awareness about culturally shaped values and biases.
	Explain how cultural point-of-view may shape the pursuit of knowledge, including theories and methods.	Take into account contextual information when making judgments about what is right or wrong. Identify effective ways to negotiate with international research partners and resolve differences using knowledge of cultural context.	Demonstrate a willingness to seek information and resources when research norms and policies are conflicting or unclear.
	Compare the relationship between students and research supervisors at partner institutions.	Prioritize the importance of research integrity issues in the context of an international collaboration and identify areas where compromise is or is not possible.	Use cultural knowledge to contribute to a collaborative environment of mutual respect, trust, and accountability.
	Compare policies and norms (explicit or implicit) for research conduct among partnering countries.		Demonstrate appreciation for the distinct contributions of all members of a collaborative research team.  Convey tolerance for different levels of language proficiency and respect for the efforts of those conducting research in a non-native language.

**Table 1, continued. Sample Learning Outcomes for Research Ethics Education in International STEM Collaborations**

“By the time they complete their course of study, students should be able to/are expected to...”

	Knowledge	Skills	Professional Attitudes
Research Practices	Explain how national/cultural context may affect researchers' views of intellectual property and data ownership.	Examine and question his or her cultural biases in assessing the value of contributions from an international research partner.	Convey awareness of and respect for local knowledge that can be contributed by international research partners and/or research subjects.
	Define plagiarism and explain how it may be viewed differently in different research cultures.	Analyze ethical and practical challenges of sharing data and resources among international research partners.	Show sensitivity to differential access to materials or technology e.g. issues of waste, unreliable internet access.
	Identify gaps and differences in national protocols and policies regarding equal access, transparency, and confidentiality.	Facilitate the sharing of data and resources among international research partners when appropriate.	Demonstrate openness to learning about local practices for data management, access and exchange.
	Explain how cultural, political, and economic contexts may shape views on information sharing and data access.	Seek effective ways to clarify ownership of knowledge and cultural and natural resources.	Demonstrate willingness to communicate with appropriate local authorities that may control the research process.
	Identify differences in national or cultural norms regarding authorship order and other formal acknowledgment procedures.	Promote team-based publication in English and local languages, and seek to address the causes of plagiarism.	Convey concern for different cultural approaches to establishing trust among international research partners.
	Describe scenarios when information and data sharing may not be possible due to national security or political concerns.	Identify methods to build the research capacity of international researchers with available material and human resources.	Convey interest in sharing benefits arising from the use of information and knowledge provided by research subjects in partner countries.

**Table 1, continued. Sample Learning Outcomes for Research Ethics Education in International STEM Collaborations**

“By the time they complete their course of study, students should be able to/are expected to...”

	Knowledge	Skills	Professional Attitudes
Ethical Framework	Define ethical values and principles and explain how they differ from laws, policies, and codes of conduct.	Identify and prepare for ethical risk in countries where research regulations differ or where none exist.	Demonstrate a willingness to seek information to place ethical issues in proper local and cultural context.
	Explain how culture may shape values and ethical principles.	Seek input from international research partners in defining and measuring the benefits and outcomes of research.	Show respect for all human lives regardless of citizenship and culture in international collaborations involving human subjects.
	Identify common ethical challenges that arise in international research collaboration(s) in one’s field.	Compare and analyze the costs and benefits to international research partners in different collaboration scenarios.	Demonstrate concern for limitations on the ability of research participants in some countries to provide informed consent.
	Provide examples of the way ethical norms and cultural values may lead to conflicts among international research partners.	Take into consideration cultural values, ethical principles, and contextual information when resolving ethical problems that arise in international research.	Acknowledge that the “right” decision in one country may lead to unintended ethical consequences in another.
	Explain how culture may shape views on research with human subjects.	Formulate and analyze alternative ways to solve an ethical problem in international research.	Respect differential impacts and broader societal outcomes of research in the home and partner country.
	Articulate ethical principles for conducting collaborative research with international research partners.	Consider how research outcomes may be presented and interpreted in different national contexts.	
	Describe collaboration scenarios where ethical decision-making may be complex and based on information that is uncertain or unclear.		

## F. Pertinent Research and Scholarship

In recent years, leading research institutes and organizations with stakes in the globalization of science have sponsored studies exploring research integrity issues in international collaborations (Burroughs Wellcome Fund and Howard Hughes Medical Institute, 2006; CGS, 2010; NAS, NAE, and IOM, 2011). Concurrently, scholars with expertise in research ethics and academic integrity have studied international collaborations and identified ethics issues peculiar to them (Anderson and Steneck, 2011; CGS, 2012). Those studies, coming from two directions, concur that some issues are general, while others are discipline-specific: in engineering, for example, cultural differences may produce variations in coding, designing, and manufacturing processes; in stem cell research, differences may produce variations in permissible methods for working with human embryos and stem cell lines.

The National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine, for example, sponsored a workshop in 2010 on “core elements” of international research collaborations. Among other findings, the workshop determined that misunderstandings may occur when institutions, researchers, and graduate students have not anticipated or do not understand national differences in the relationships between government, industry, and universities, or when collaborators hold conflicting views about enlisting industry representatives in research projects (NAS, NAE, and IOM, 2011). Prior CGS projects similarly have identified areas of potential misunderstanding, including conflicts of interest and commitment and questions of intellectual property, publication practices and responsible authorship (including plagiarism), and access, sharing, and exchange of resources and materials.<sup>6</sup>

One CGS intervention from 2008, the CGS Global Summit on Graduate Education, “Scholarly Integrity and Research Ethics in a Global Context,” brought together graduate deans and other university leaders from 10 countries not only to investigate these problems, but also to suggest possible actions.<sup>7</sup> Participants intentionally did not seek a consensus on the *best approach* for fostering research integrity through educational programs, but they agreed that international graduate schools should establish common frameworks that recognize the value of *different approaches*,

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<sup>6</sup> PIs from NSF IGERTs and PIREs participating in a CGS Focus Group indicated that responsible authorship and plagiarism were issues of particular concern as universities seek to address cultural differences in international degree programs and research collaborations (CGS, 2010, p. 57).

<sup>7</sup> Participants identified 1) COI, COC, and IP issues and 2) access, sharing, and exchange of scientific resources, as key areas where graduate students need more education to function successfully in a global context (CGS, 2009b).

depending on contexts, needs, and objectives (CGS, 2009b).<sup>8</sup> Such frameworks, for example, might attend to challenges such as how research ethics education can most effectively teach the foundational values of research integrity when an internationally diverse group of students may interpret basic concepts such as “responsibility” or “professionalism” differently.

Recognizing that some differences may originate in overall systems for graduate education, scholars have urged attention to systemic variations when designing programs for research ethics education. Variations at a cultural or institutional level, for example, might reflect resources or professional status, such as

- access to materials and technology;
- the number of academic positions open to doctoral students;
- the pressure on students to publish research outcomes; and
- the degree to which governmental or corporate agendas can affect research and its rewards (Anderson et al., 2011).

Variations at an interpersonal level might involve program or laboratory protocols, such as

- the relative emphasis on group as opposed to individual achievement and success;
- the hierarchy or balance of power among members of the research team;
- the nature of the relationship between supervisors and students; or
- the extent to which student contributions to research are recognized and rewarded.

Projects conducted with support from NSF’s Ethics Education in Science and Engineering (ESEE) program, in addition to the CGS project under discussion in this monograph, have suggested promising curricular models for international ethics education. (Newberry et al., 2009). Texas Tech University, for example, has developed a training program for international students in engineering that factors in language barriers, stages of acculturation, and cultural expectations as potentially affecting a student’s understanding of the ethical and professional norms of U.S.-based engineering research. And Brown University has joined the Indian Institute of Technology and Zhejiang University in China in an international project on *international* ethics training.

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<sup>8</sup> Participating institutions appeared to be at different points on a spectrum defined by “compliance-based” and “values-based” approaches to research integrity education. The former approach typically emphasizes learning about and adhering to norms and codes of conduct, whereas the latter emphasizes identifying and internalizing standards for integrity. Institutions in countries where regulatory frameworks are ill defined or poorly understood may place priority on compliance issues, while those in countries where regulatory frameworks are well understood may emphasize the values of the research culture. Compliance-based approaches and values-based approaches are not mutually exclusive: they frequently appear in combination with different relative emphases (CGS 2009b; CGS 2012; Mayer and Steneck, 2007, p. 27).

The growth of international collaborations, not surprisingly, has produced an interest in identifying and assessing their outcomes (see, for example, Abt Associates, 2011). The Center for Innovation and Research in Graduate Education (CIRGE), for instance, has found that the social and intercultural skills necessary for successful international research collaboration—such as building trust, adapting to cultural differences, and communicating effectively—are the same skills necessary for building professional and research networks. CIRGE therefore recommends assessment not only of the research conducted in a collaboration, but also of the sustainability of professional relationships built during a collaboration (Blumenfield and Nerad, 2012).

# III. Project Descriptions

## A. Individual and Shared Strategies

The CGS project under discussion here differed from the CIRGE project. As the Examples of Learning Outcomes in Part II make clear, the CGS project focused on *preparation* of students for international collaborations and on outcomes of that preparation—not on international research collaborations as such and their outcomes. CGS asked its four participating institutions to design programs for enhancing and assessing research ethics education. Though CGS specified basic requirements and selection criteria, institutions were free to create programs aligned with their particular institutional cultures, student needs, resources, and other factors.<sup>9</sup>

### *Emory University*

Emory University built on the foundation of Emory's prior participation in the CGS Program for Scholarly Integrity (PSI). Emory extended its PSI project, which had integrated instruction in the responsible conduct of research into the training of all doctoral students, to include programming specific to international research collaborations (see Appendix A1).

Focusing on both U.S. students abroad and international students in the U.S., Emory and its Laney Graduate School drew on several existing resources in addition to the PSI: Atlanta Clinical and Translational Science Institute, Center for Ethics, Office of Technology Transfer, International Student and Scholar Services, and Faculty Advisory Committee (FAC). Finally, Laney worked with the FAC and the Assessment Team from the original PSI project to develop assessment methods for its now internationalized version (see Appendix B1).

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<sup>9</sup> Key selection criteria specified in the RFP were: 1) Quality of action plan to integrate research integrity education into graduate international collaborations and/or international issues into research integrity programs. 2) Potential of project to impact graduate education in the sciences and engineering beyond immediate participants. 3) Quality of plan to develop and test learning outcomes that reflect key research ethics issues relevant to international collaboration.

In one particularly innovative tactic, Laney held a competition for which students created workshops designed to meet one of the knowledge, skill, or attitude learning outcomes identified by the FAC. Competition winners were mentored by faculty in how to disseminate their workshop ideas beyond Emory through conference presentations and journal publications.<sup>10</sup>

### *Northern Arizona University*

Northern Arizona University (NAU) also used its prior activities in the CGS PSI as the base for a blended program that significantly expanded existing research ethics and scholarly integrity efforts into an international sphere—preparing graduates for global citizenship and supporting NAU’s commitment to becoming a global campus.

NAU’s robust program comprises an overview training module, “Research Integrity in International Collaborative Contexts,” and disciplinary modules in biological and life sciences, forestry and conservation, health sciences, and psychological and social sciences; students are required to take the overview module plus one disciplinary module (see Appendix A2). Collaterally, NAU introduced and offers once each year a “Training the Trainers” Workshop for faculty and staff engaged in collaborative international research or in teaching research methods or ethics.

The Graduate School, in effect, reverse engineered its ethics program. It first convened focus groups of 1) STEM faculty and researchers engaged in international programs or research collaborations, and 2) international students from STEM fields and U.S. graduate students with international experience. It then worked with these groups to identify appropriate learning outcomes across core areas; developed content, curriculum, and programming to produce those outcomes; and, with the Office of Academic Assessment, developed assessments for them.<sup>11</sup>

### *University of Oklahoma*

The University of Oklahoma (OU) requires all graduate students receiving a university stipend to attend a two-day, in-class ethics education program. Presented by senior doctoral students with training in the area, the program teaches students to understand and apply existing ethical research guidelines, identify situational constraints in ethical decision-making, reflect on personal biases, and apply various ethical decision-making strategies.

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<sup>10</sup> One winning entry, “Which Hat to Wear: Ethical Dilemmas of the Clinician-Researcher,” posed the case study of a hypothetical masters-educated nurse practitioner who first worked in a small city in Guatemala as a clinician, developing relationships with local clinicians, health workers, and patients from the community, and subsequently returned as a doctoral candidate conducting research for her dissertation, having not only to navigate unfamiliar regulatory guidelines and research protocols, but also to negotiate reactions to her change in roles.

<sup>11</sup> The core areas were: 1) collaborative research, 2) conflicts of interest and intellectual property, 3) publication practices and responsible authorship, and 4) resources and materials—access, sharing, and exchange. NAU also developed a seven-page document, “Research Integrity in International Collaborative Contexts: Learning Outcomes.”

OU designed its project for the CGS initiative to determine specifically if 1) U.S. and international students employ different strategies in ethical decision-making and 2) international students benefit from particular types of instructional exercises. The results were published in the research paper, "A Comparison of the Effects of Ethics Training on International and US Students."<sup>12</sup>

Based on these findings and other information, OU added a two-hour instructional block on cross-cultural differences in ethical decision-making to its previously noted two-day ethics education program. Correspondingly, OU also added a new set of survey evaluation questions to the existing outcomes assessment instrument to measure the effectiveness of this new block of instruction.

### *Virginia Polytechnic Institute and State University (Virginia Tech)*

At the time of the CGS project, the Graduate School of Virginia Tech (VT) was engaged in an initiative to inventory, coordinate, and enhance research integrity activities throughout the university. For the CGS project per se, VT collated those activities to produce a comprehensive matrix of programs for VT graduate students conducting collaborative research abroad and for international graduate students studying at VT.

Specific elements in the project included, among many others, incorporation of research ethics education and its assessment into the Graduate School's Global Perspectives Program and the International Research Abroad graduate certificate; and incorporation of research ethics education into the Graduate Honor system to help international students understand U.S. research ethics and professional standards in their cultural context (see Appendix A3).

The VT Graduate School mandated ethics education as a *requirement* for all incoming graduate students beginning Fall 2014, asking departments to develop their own plans for how their students would meet this requirement. The Graduate School also developed a concise list of learning outcomes with assessment strategies for measuring them (see Appendix B2).

### *Shared Strategies*

As the summaries above suggest, participating institutions shared a number of strategies, including

- 1) development of content for curriculum and programming;
- 2) integration of curriculum and programming into existing structures or creation of new structures;
- 3) outreach to constituents prior to programming combined with dissemination of information following it; and
- 4) building of internal and external partnerships.

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<sup>12</sup> See Steele et al, 2015.

*Content.* Educational programs on research ethics for U.S. students engaging in study or collaborative research abroad and for international students studying in the U.S. covered a wide array of topics that have general relevance across many STEM fields. Typical topics covered included

- conflicts of interest and intellectual property,
- collaborative research,
- publication practices and responsible authorship, cultural differences and cultural sensitivity,
- legal environments for international research,
- political/social/economic factors that may affect international collaborative research, and
- common issues in access, sharing, and exchange of resources and materials.

In addition to including the right topics, programs must have sound, objective, data-based, verifiable, reliable, and useful content on those topics whose effectiveness can be measured and whose measures then can be utilized in a “feedback loop” to improve content and its delivery on an ongoing basis. This basic strategy informed all four projects, though tactics for advancing it varied considerably from institution to institution.

*Curriculum and Programming.* Educational content has value only to the degree that it successfully reaches and influences its target audiences. All four project participants developed curriculum and programming for both domestic and international students, but their offerings differed in scale and scope of activities, pedagogical methods and delivery systems, integration into graduate studies and training, and extent to which student participation was voluntary or mandatory. In some cases, participants introduced new content into existing courses or student orientations; in others, they created new courses or workshops (see Appendix A). In some cases, students and advisors in effect determined student participation; in others, the university required it.

*Outreach and Dissemination.* Participants all reached out to multiple constituents for input before developing content, curriculum, and programming: STEM faculty and students in general, and international students and students with international experience in particular; experts in research ethics and in “best practices” for teaching and learning it, and experts in the intercultural dimensions of international research; professional organizations, disciplinary and otherwise, with experience in the area, and institutional administrators holding the purse-strings. Participants also used the web, social media, and other digital platforms as tools for broadcasting the content of courses and programs after they had taken place—outreach particularly valuable for students unable to attend in-person sessions.

*Partnerships.* All four graduate schools in the project recognized the importance of forming *intramural* partnerships with student groups, program faculties, and the campus units responsible for 1) externally funded research, 2) research and scholarly integrity, 3) international programs and students, and 4) learning outcomes assessment. In addition to their work with CGS and NSF, they forged *extramural* connections with disciplinary professional organizations and with international universities.

## B. Challenges and Opportunities

### *Content*

*Challenges.* Domestic and international students alike often begin graduate study with varying amounts of research experience and exposure to research ethics education. Domestic students often need more preparation for research collaborations in international venues, and for collaborations with international colleagues in a U.S. setting. International students enrolled in U.S. graduate programs often need more preparation in U.S. practices for research and scholarly ethics that may differ from those in their countries of origin. These multiple and competing needs—all with importance and urgency—must compete for scarce institutional resources.

*Opportunities.* Primary opportunities include occasions for preparing U.S. students to succeed abroad and international students to succeed in the U.S.; ensuring that international research collaborations are ethical and collegial; and increasing the likelihood that the collaborations will be productive and have impact. Collateral opportunities include occasions for bringing multiple constituencies and stakeholders together in a planning process—students, faculty, research staff, administrators, and external partners. This not only ensures that different perspectives and areas of expertise are brought to bear on content, but also empowers students and builds intellectual community.

### *Curriculum and Programming*

*Challenges.* Graduate students engage enthusiastically only with content that they perceive as inherently interesting and intrinsically valuable; as advancing or potentially advancing their studies and future careers; and as reliable in substance, capacious in breadth, and diverse in outlook. Since graduate students generally have rigid schedules and little disposable time, they also want the curriculum and programming that delivers the content to be accessible, flexible, and efficient. Faculty mentors, in addition, typically encourage their students to participate only in activities with clear value and effectiveness.

*Opportunities.* Graduate programs that integrate ethics education fully and seamlessly into coursework and research demonstrate the faculty's commitment to the activity, facilitate the student's participation in the activity, and provide occasions for confronting ethical issues in simulated rather than real settings. This holds for ethics education in general and for ethics education focused on international issues. Graduate programs that recruit faculty into the *delivery* of content, in addition to its development, not only ensure professional presentations, but also predispose faculty to encourage student participation. Finally, while graduate programs might provoke

students and faculty by making ethics education a *requirement*, they also will guarantee participation in it.

### *Outreach and Dissemination*

*Challenges.* Besides engaging constituencies in planning and delivering research ethics education, graduate programs also must ensure that it reaches students in numbers, especially if research ethics programming is *supplemental* to existing coursework or labwork and/or is not required. Graduate programs must publicize the existence and benefits of such programming in advance in ways that are appealing and persuasive, and also must disseminate the contents of the programming after the fact in ways that are compelling. Programs must demonstrate *concrete* outcomes from research ethics activities— show that students have heightened their knowledge or sharpened their skill—in order to induce students to participate in future offerings.

*Opportunities.* Websites and social media probably provide the best mechanisms for outreach and dissemination, though certainly not the only ones (pamphlets, telephone calls, and emails still work). A well-constructed and maintained web presence can tailor messaging to different target audiences (domestic or international students, for example); provide up-to-date information on coming programming and material from past programming; and enable interactive activities, such as chat sessions, that allow students and faculty to discuss issues in real time and with relative ease. Robust social media, beside their inherent benefits, can direct traffic to the website.

### *Partnerships*

*Challenges.* As noted earlier, the graduate schools participating in this project recognized the critical importance of forming strong partnerships with faculty from the very first steps. They developed methods and inducements to recruit faculty— especially experienced and influential senior faculty—into the work of planning content, building curriculum and providing programming, and encouraging student participation. The graduate schools also saw the necessity of forming partnerships with administrators at campus, college, and department levels: they had to persuade administrators with many competing claims on their *resources*, *influence*, and *attention* that the value of research ethics training in international settings warrants investment of all three. All of this can be done, but none of it easily.

*Opportunities.* Recruiting faculty into research ethics education brings many benefits: faculty have relevant expertise and experience; ongoing direct contact with students and their needs and wants; the ability to encourage or even require students to participate; academic legitimization for the activity; and political influence with chairs and other administrators. Similarly, lobbying administrators on research ethics education also brings benefits: administrators can provide financial and personnel resources, political backing for the implementation of change, and institutional endorsement. Finally, administrators, faculty, and students *working together* to advance an initiative create, by definition, a campus graduate community— something of great value, and elusiveness, in large research universities.

# IV. Survey Results

CGS surveyed both graduate deans and graduate students at institutions participating in this project. The surveys together identified challenges and opportunities at their institutions and gave CGS and the participants a preliminary “read” on the outcomes and future promise of initiatives introduced during the project. A summary of the results follows. Since the project included only four institutions, and since their objectives and target populations varied, these results are offered not as data for generalization but as background information for practical use.

## A. Graduate School Inventory Survey

CGS surveyed the graduate deans of the participating institutions to solicit information on 1) the kinds of initiatives in place to train graduate students to conduct responsible and ethical research both in general and in international collaborations, and 2) the specific formats used in those initiatives to “expose” students to that training. The first iteration of the survey, conducted in 2013, concerned resources, activities, and programs existing *before* implementation of the project; and the second iteration, conducted in 2015, concerned those developed *during* the project.

### *Exposure to Research Ethics Training*

In 2013, prior to project implementation, participating deans reported that 1) graduate students working in international collaborations were exposed to training in general research ethics issues, but 2) were *not* exposed to training in research ethics issues specific to international collaborations. In 2015, by contrast, *after project implementation*, all four deans reported that their institutions had introduced, in the interim, research ethics training *specific* to international collaborations, typically through hybrids of university-wide and discipline-based training programs.

CGS also asked graduate deans to identify the *means* used to expose students to research ethics training and the frequency of usage—again, both in 2013 and 2015. Participants reported offering face-to-face courses, online courses/websites, orientations, brownbag lunches/informal discussions and workshops, and other means. Usage data is reported below.

### *Outcomes Assessment*

CGS asked graduate deans in both iterations of the survey to identify mechanisms in place 1) to track graduate student participation in research ethics training, and 2) to assess the impact of this training. Schools also were asked to estimate the numbers of graduate students currently participating in international collaborations in order to judge how many current and future students likely would benefit from research ethics

education tailored to international issues.

Graduate school respondents reported having mechanisms in place, prior to the CGS project, for tracking graduate student participation in general research ethics education, but *not* in research ethics education for international collaborations. They also reported *not* having mechanisms in place, prior to the project, to assess the impact of international ethics education.

Respondents suggested two contributing causes: 1) many educational activities, such as brownbag lunches, lack formality, so tracking participation and assessing outcomes are difficult; and 2) many funding agencies require training in *responsible conduct of research*, but not training in either general or specific *research ethics*, so institutions respond accordingly and direct resources and efforts to the former rather than the latter.

As indicated in Part III, in any event, the graduate schools participating in the CGS project did implement outcomes assessment of research ethics courses, online learning modules, and other formal activities. In one case, two participants—Emory and the University of Oklahoma—partnered in conducting a series of pre- and post-program assessments that measure “ethicality” as demonstrated by student responses to a series of ethical scenarios in their fields of study.<sup>13</sup> Other participants similarly used pre- and post-program assessments, with varying metrics, to determine the effectiveness of their training.

## B. Graduate Student Survey

CGS and participating institutions also conducted two iterations of a student survey—the first in 2013 and the second in 2015—to gather information on graduate student awareness of, participation in, and attitudes toward, resources and activities both in research ethics training in general and in training specific to international research collaborations. The institutions submitted to CGS a combined total of 3,860 valid graduate student responses. There were 2,172 respondents in 2013 (1,363 STEM and 809 non-STEM) and 1,688 in 2015 (1,087 STEM and 601 non-STEM). These were analyzed in aggregate, by field of study (STEM versus non-STEM), and by international experience. Results are reported below.

### *Participation in Educational Activities*

The surveys asked graduate students to report on their awareness of, and/or participation in, four previously mentioned types of activities—*face-to-face courses*; *online courses/websites*; *orientations*; and *brownbag lunches/informal discussions and workshops*—on both *general research ethics* topics and on topics *specific to international research collaborations*. For each mode and type of research ethics education, students selected 1) not offered or don't know, 2) yes, offered but I have not participated, or 3) yes, offered and I participated.

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<sup>13</sup> In addition to this collaboration, Emory also implemented training specific to international collaborations within its existing Jones Program for Ethics, and incorporated outcomes assessment specific to that training into the Jones Program's rigorous tracking and learning outcomes policies and practices.

Over the initial two-year course of the project, awareness of, and participation in, activities on *general research ethics* topics increased for all students, regardless of their STEM status or international experience. While significantly more students in both 2013 and 2015 reported participation in general research ethics training than in training specific to international collaborations, this doubtless reflects the fact that students engaged in *international* research are a relatively small subset of all students engaged in *all* research. The number of students aware of, and participating in, training for international research, in any event, increased from 2013 to 2015 (see Tables 2 and 3 below; see Appendix C, Tables 2a and 3a, for data based on STEM or non-STEM status *and* on international experience).

**Table 2. General Research Ethics Awareness and Participation by STEM/Non-STEM Status**

	2013			2015		
	Respondents	STEM	Non-STEM	Respondents	STEM	Non-STEM
Face-to-Face course(s)	64%	61%	70%	69%	68%	72%
Online course(s)/Websites	43%	41%	47%	47%	47%	49%
Orientations (Program or Institution)	60%	60%	59%	74%	76%	72%
Brownbag/Informal Discussions and Workshops	36%	35%	39%	40%	41%	40%

*Data Sources: 2015 CGS Graduate Student Survey and 2013 CGS Graduate Student Survey.*

**Table 3. International Research Ethics Awareness and Participation by STEM/Non-STEM Status**

	2013			2015		
	All Respondents	STEM	Non-STEM	All Respondents	STEM	Non-STEM
Face-to-Face course(s)	13%	12%	16%	19%	19%	19%
Online course(s)/Websites	9%	10%	9%	17%	18%	17%
Orientations (Program or Institution)	14%	14%	14%	24%	25%	23%
Brownbag/Informal Discussions and Workshops	9%	9%	9%	6%	15%	15%

*Data Sources: 2015 CGS Graduate Student Survey and 2013 CGS Graduate Student Survey.*

## Confidence in Identifying and Managing Ethical Issues

Graduate students also reported on their level of confidence in being prepared to identify and manage potential ethical issues in international research collaborations. Student confidence appears to have risen from 2013 to 2015: students who reported being “somewhat confident” rose from 55% to 56% and “very confident” from 19% to 21%, while those who reported feeling “not confident” decreased from 27% to 23%. Both STEM and non-STEM students reflected this trend, with STEM students reporting, overall, higher confidence than non-STEM students (see Table 3 below; see Appendix C, Table 3a, for data based on STEM or non-STEM status *and* on international experience).

**Table 4. Student Confidence in *International* Ethics by STEM/Non-STEM Participation**

	2013			2015		
	All Respondents	STEM	Non-STEM	All Respondents	STEM	Non-STEM
Not confident	27%	24%	32%	23%	21%	29%
Somewhat confident	55%	57%	50%	56%	58%	52%
Very confident	19%	19%	17%	21%	21%	19%

*NOTE: Excludes respondents who did not provide an answer to the questions.*

*Data Sources: 2015 CGS Graduate Student Survey and 2013 CGS Graduate Student Survey.*

## Outcomes

A clear outcome of the CGS project was an increase in student awareness of, and participation in, research ethics education. A less clear outcome was the increase in perceived student ability to identify and manage ethical issues, since confidence is a more subjective measure than participation and since confidence reflects an inseparable mix of one’s sense of one’s knowledge or skills and one’s awareness of the scale and complexity of the issues.

## Summary

Survey results suggest that initiatives advanced by participating graduate schools 1) positively affected student awareness of, and participation in, research ethics education for international collaborations, and 2) *may have* positively affected student confidence in addressing the pertinent issues. The results also suggest that challenges and opportunities remain for research ethics education for international collaborations: *in a word, student awareness of, and participation in, the latter must improve if our students are to meet the challenges posed by globalized research.*

# V. Recommendations

The four institutions participating in this project utilized existing processes and structures, and/or created new ones, to build *content, curriculum and programming, outreach and communications, and partnerships* for research ethics education for international collaborations. Their efforts generated a number of “best practices” that CGS recommends to its member graduate schools. These include

## Content

- Identify topics of interest to 1) U.S. students studying, conducting field research, or engaging in collaborative research abroad, and 2) international students studying and conducting research in U.S. institutions.
- Identify topics in existing programs for research ethics education in general that are applicable to programs designed specifically for research ethics education for international collaborations.
- Employ *as content for reflection* the similarities and differences between research ethics in general and research ethics for international collaborations.
- Ensure that content is credible (for example, free of obvious or hidden bias), reliable, verifiable and sufficiently valuable to justify investments of time, effort, and resources.
- Solicit the input of 1) faculty in STEM fields and 2) experts in research ethics to ensure optimal importance, relevance, and usefulness of content provided.
- Solicit the input of students to gather topics likely to engage students and increase participation.
- Identify current level of student awareness of, and participation in, available research ethics education.
- Test the value of content using rigorous and ongoing learning outcomes assessment.

## Curriculum and Programming

- Incorporate 1) international research issues into existing research ethics programming; 2) research ethics issues into programming for international study or research; and 3) research ethics training into all institutionally supported international research projects.
- Weigh the costs and benefits of 1) embedding research ethics education into existing curriculum and programming, or 2) introducing research ethics education as new curriculum and programming. This applies equally to research ethics in general and to research ethics in international collaborations.
- If curriculum and programming that would accommodate embedded research ethics training exist, try first to use them; if they do not exist, create them or new curriculum and programming.
- If contemplating the establishment of research ethics education (general or international) as a *degree requirement*, consider pressures on existing required curriculum, problems associated with creating new required curriculum, and demands that either option will place on faculty and students.
- Develop programming that allows students to engage research ethics issues in collaboration and to apply them in simulated and/or real situations.
- Use multiple program formats to reach a broad range of graduate students, including part-time students and graduate assistants with heavy research, teaching, or administrative obligations.

## Outreach and Communications

- Reach out to *all* relevant constituencies—graduate programs, faculty, staff, students, and administrators—for substantive initial input and ongoing feedback in the development, implementation, and assessment of research ethics training.
- Ensure that educational materials and activities, once developed, are readily and easily accessible to all constituencies—particularly those unable to participate in person—through multiple media, especially a robust web presence.
- Whether revising an existing website or creating a new one, present materials that meet the needs and expectations of targeted populations; either use an existing site with *heavy traffic* or *heavily advertise* a new site (employing social media, in either case, to attract visitors); secure adequate and sustainable resources for ongoing, up-to-date, and thorough site maintenance; ensure accessibility.

## Partnerships

- Form and maintain strong partnerships with STEM faculties and student organizations for all phases of ethics training: design, implementation, ongoing outcomes assessment, and use of assessment data collected.
- Form and maintain strong partnerships with departmental, collegiate, and campus administrators who command the resources and political capital necessary for the success and sustainability of large projects.
- Form and maintain strong partnerships with graduate programs and other campus units to ensure 1) maximum cooperation, coordination, pooling of resources, and proper distribution of responsibility and authority, and 2) minimum inefficiency and redundancy through lack of communication and/or duplication of effort.

# Part VI. Conclusion

International collaborations are the wave of the future—and *that future is now*. Scientists and engineers from all nations increasingly conduct research in international settings, collaborate with international colleagues, and tackle problems that emerge in a globalized economy. To work successfully in this context, they must know how to navigate national standards and regulations that may be unfamiliar to them and how to negotiate ethical issues that they may not have encountered previously.

Preparing STEM graduate students to thrive in that future is “*more than*” professional development—it is *integral to* research training. Growing numbers of students already work in international contexts—U.S. students studying, conducting field research, or participating in research collaborations abroad, and international students studying or conducting research in the U.S. Ensuring that these students have the tools to succeed now, as *students*, has urgency, just as ensuring that they *will* have the tools to succeed later, as *scientists and engineers*, has consequence.

Through the surveys conducted in the CGS project, students expressed an acute awareness of the importance of research ethics education for research in general and for international collaborations in particular. Standards and ethics matter to students: U.S. students want to comply with the national standards applicable to their study and research abroad, and international students want to comply with the standards applicable to their study and research in the U.S. All students also want to feel confident about navigating the often less formal or visible social mores and codes, as well as professional etiquette, at play in research settings—these easily can produce occasions requiring difficult and sound ethical decision making.

As indicated in the Introduction to this monograph, however, a basic challenge has been that *programs and other training initiatives in Responsible Conduct of Research or research ethics typically do not cover in detail the issues raised by RCR and research ethics in international contexts, while joint international degree programs and international research collaborations typically do not include explicit attention to RCR or research ethics*. With CGS leadership and NSF sponsorship, the four institutions participating in this project developed programs and initiatives meant to bridge that gap and to provide their students with systematic training in research ethics for international collaborations.

In meeting those objectives, the institutions had to focus attention, effort, and resources in four general areas: 1) drawing on the expertise of faculty in STEM fields and in research ethics, the institutions had to develop credible, reliable, verifiable, and valuable *content*; 2) they had to integrate that content into existing *curricula* or to

design new curricula, and they had to supplement curriculum with *programming* that would attract and hold student attention; 3) they had to create *outreach* mechanisms to engage multiple constituencies in design, implementation, and assessment of content, curriculum, and programming, as well as advance *communications* strategies ensuring that the materials developed reached target audiences; and 4) they had to form robust and active *partnerships* with those constituencies—programs, faculty, students, and administrators—to succeed at each step of their projects.

The participating institutions also incorporated learning outcomes assessment into their initiatives—a critical step in the development of sound research ethics education for international contexts. Identifying and assessing explicit learning outcomes, for example, institutions can ensure not only that their students acquire the competencies needed to succeed in international research collaborations, but also that such competencies are not simply assumed as an “implied” part of graduate training. Engaging graduate deans, STEM faculty, and graduate students in this particular exercise in learning outcomes, moreover, institutions can derive the collateral benefit of increasing knowledge of, and engagement in, graduate learning outcomes in general.

CGS intended the overall project, of course, to extend beyond the four participating institutions. The methods developed by participants to identify gaps in research ethics training, particularly for international collaborations, as well as to gauge relevant student experiences and expectations, provide models that most universities can use “as is” or with adaptation. The strategies employed by participants to develop and assess content, curriculum and programming, outreach and communications, and partnerships, likewise provide models that most universities, again, can use “as is” or can adapt to fit their own cultures, structures, resources, and objectives. In a word, CGS intended this project to produce tested, replicable, and sustainable models.

CGS hopes that these well-constructed models will provide value for our member graduate schools and their graduate programs, faculty, and students, as well as for the international graduate community of STEM researchers.

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# Appendix A

## Sample Syllabi

### A1. Emory University JPE 610 Workshop Topics (2013-2017)

“These workshops integrate aspects of the sample learning outcomes template provided by CGS. Each session addresses issues related to research practice, ethical values, and cultural context. Students may register for these sessions individually, and participation is recorded on the student’s transcript. Participation in at least four workshops is required for graduation.” (Source: 2013 Interim Narrative Report)

#### Fall 2013

Ethical Tensions between Objectivity and Advocacy  
Graduate Students and Public Scholarship  
“Secular Ethics;” Discussion session related to the visit of the Dalai Lama  
Ethics of Peer Review  
Ethics of Collaborations  
Ethics of Human Subjects Research  
Ethics of Collecting and Displaying Objects  
Teaching with Public Scholarship  
Why are research ethics so important?  
Ethics of Ethnography  
Ethics of Using Sources

#### Spring 2014

Ethics of Mentoring  
Ethics of “Team Science”  
Ethics of Translational Research  
Ethics of Academic Citizenship  
Ethics of Digital Scholarship  
Ethics of Using Animals in Research  
Ethics of Archival Research  
Ethics of Teaching  
Ethics of Teaching: Advice from 2013 Winners of the Emory Williams Award for Distinguished Teaching

## Fall 2014

International Research Ethics/ Case Competition  
Reception  
Ethics of Ethnography  
Human Subjects Research Risk  
Conflict of Interest in Peer Review  
The Pathogenesis of Research Misconduct  
Ethical Issues in Open Access Publishing

## Spring 2015

Archiving Your Dissertation Data to Support Responsible Research  
Ethics Across Borders: Engaging in International Human Subjects Research  
The Ethics of Access  
Virtual Research Ethics  
Forced Codeswitching: How Teachers Unintentionally 'Ghost' Students

## Fall 2015

Conducting Global Work  
Oxytocin: Elixir of the Social Brain  
Ethics and the Responsibility of the PhD  
The Student-Faculty Mentor Relationship  
The Dilemma of Reporting Plagiarism  
What Retractions Tell Us: Good and Bad About Self-Corrections

## Spring 2016

Healthy Dissent: Urban Ecologies and the Art of Relational Politics  
Ethics of Teaching  
Contentious Issues in Global Health  
Gun Violence and Mental Health  
Teaching In Prisons  
The Color of Justice w/o Prejudice: Youth, Race, and Crime in Case of Harlem 6  
Dean's Talk on Microaggressions  
Discussions of Justice and Discrimination in Diverse Classrooms

## Fall 2016

The End of White Christian America

Conducting Global Work

Faculty-Graduate Student Mentoring and Diversity

Racial Profiling and Policing: How Can Neuroscience Help

Racism and Health in the South

Prescribing Price: The Ethics, Science, and Business of Drug Development and Pricing

Engagement in the Arts: Samuel Beckett in Prison

Disciplinary Disharmonies: Can There Be A Shared Vision for Global Neuroscience?

Ethics of Authorship and Peer-Review Process

## Spring 2017

From Ferguson to Standing Rock: Religious Faith, Righteous Feminists and Holy Fire

Autism Inequities in Diagnosis and Services Based on Race, Ethnicity, SES and Gender

Women in Science Panel

The Social Life of DNA: Race, Reparations, and Reconciliation After the Genome

The Use of Pre-clinical Biomarkers for Brain Diseases: A Neuroethical Dilemma

## A2. Northern Arizona University Overview Module for Research Integrity in International Contexts

Northern Arizona University offers an overview module and four disciplinary modules; all students are required to complete the former and one of the latter. The document presented here comprises excerpts from the twenty-page overview module description.

### Welcome!

Welcome to the Research Integrity in International Collaborative Contexts Training Module. In this module, you will begin with an overview of terms, definitions, and key issue areas. This introduction will familiarize you with the major debates and terms specific to international collaboration. Upon completion of the Overview Module, you will then select a discipline specific module that will offer a training catered to the needs of someone in your field of study. Although all of the modules are about research integrity issues when collaborating internationally, the discipline specific modules will offer examples, case studies, and terms unique to their field of study.

### Overview: Collaborative Projects and International Research Issues

#### *Required for All Students*

After reviewing this module, you should be able to:

- Understand the major issue areas within research integrity in international collaborative contexts.
- Become familiar with the major terms and definitions within each issue area.
- Explain how working in an international collaborative context may shape or change these major research integrity issues.
- Understand how each issue area has shaped national or international laws, rules, and norms related to research integrity.

#### *Biological and Life Sciences*

This module emphasizes issues important in the Biological and Life Sciences, an area of research that is increasingly collaborative, both nationally and internationally, and is changing due to advances in the capacity to generate data and to rapidly communicate results and share data. The module expands on ideas introduced in the Overview Module of the course, including collaborative research, conflict of interest, data management and sharing, and publication practices and responsible authorship. Each sub-module contains one or more case studies, videos, or readings for the in-person or online discussions. Examples will come largely from genetics and ecology.

### *Forestry and Conservation*

This module emphasizes issues important in Forestry and Conservation, an area of research that is increasingly collaborative, both nationally and internationally, and that changing with advances in the capacity to generate data and to rapidly communicate results and share data. This module will introduce you to some of the current issues in developing interdisciplinary and/or inter-institutional research collaboration in the general area of forestry, which include conservation sciences and natural resource management.

### *Health Sciences*

This module emphasizes issues important in the Health Sciences, an area of research that is increasingly collaborative and international in scope. Students will learn about ethics and its history, as well as the rules, regulations, and professional norms of the field. Since human subjects are often the participants in this field, the importance of confidentiality and privacy will be discussed, especially in regards to data management. International collaborations introduce different cultures and social practices into the research, so cross-cultural and international issues will be introduced for thought and discussion during the in-person section of the training.

### *Psychological and Social Sciences*

This module emphasizes issues important in the Psychological and Social Sciences, an area of research collaborative and international in scope, with its fair share of research misconduct. In this module, we will discuss four topics relevant to research in the psychological, and to some extent, other social sciences:

1. issues and ethics in cross-cultural collaborative research,
2. standards for responsible authorship and publication practices, including the topic of plagiarism,
3. new standards for access, sharing and exchange of intellectual resources, and materials, including new emphasis on “registered replication reports” (e.g., APA standards), and
4. information about conflicts of interest and avoidance strategies.

Each sub-module will outline specific learning outcomes and include a discussion of the topic, with special attention to how culture may contribute additional considerations to the ethical conduct of research in international collaborative settings. Where appropriate, case studies that provide real-world examples of the complexity inherent in collaboration will be included.

## Overview: Collaborative Projects and International Research Issues (Required for All Students)

### *Introduction*

The following module will familiarize you with the major issue areas of Research Integrity in

International Collaborative Contexts. It is recommended that you complete each section within this module in the order they appear to best learn the introductory material. After completing this section, you will then take a short quiz before advancing to your discipline-specific module.

### *Collaborative Research*

Collaborative Research includes any research that involves the combined efforts of multiple researchers or contributors facilitating the completion of a research project, either domestically or in an international collaborative context. This form of research is independent of the funding from or intellectual efforts of any single individual.

### *Conflicts of Interest & Intellectual Property*

Conflicts of Interest are competing obligations and interests that can lead to competing responsibilities and bias.

### *Publication Practices and Responsible Authorship*

Authorship is the credit given to those who conducted research and made the research available for public consumption through a published work.

### *Data Management: Access, Sharing, and Exchange*

Data Management includes the ownership, collection, storage, and sharing of research data.

## Collaborative Research

### *Definition*

Collaboration requires setting ground rules regarding roles and relationships of researchers, project management, authorship, and sharing materials and information by the collaborating partners. Although there is no easy solution for such problems, it is evident that any solution needs to begin with improved communication (Kahn, Cherng, Mayer, Murray, and Lagakos, 2000). The nature of collaborations is variable, but responsible collaborations are always defined by openness and early, on-going communication. Science is a communal enterprise; both science and society are best served by collegiality and open collaboration across disciplines and cultures.

There should be a mutual understanding of what is to be exchanged through the collaboration, how the research will be undertaken, and how the products of the collaboration will be shared. Collaboration is most likely to succeed if expectations are clearly communicated (and perhaps documented) before commitments are made. Collaboration enables the free exchange of ideas from scholars of diverse disciplinary or scholarly backgrounds and provides greater opportunity for scientific breakthroughs. Agreements in the form of a Memorandum of Understanding, for example, are the

primary mechanisms through which collaborative research is formalized (U.S. Department of Health and Human Services Office of Research Integrity, 2013). Despite the benefits of collaborative research, collaborations are also a frequent source of problems, in part because collaboration can take such different forms.

For many reasons, science increasingly depends on research collaborations and particularly international collaborations. No single person has the skills, knowledge, and resources to address all research problems; a judicious choice of collaborators can save considerable time and money. Collaboration implies that two or more people have joined together for a common purpose, which may include any arrangement of shared time, work, resources, unique materials, data, ideas, or money. Once the work is completed, credit and responsibility might then be shared in a number of ways.

Collaborations may not even begin because of reluctance to share or work together, and if started, collaborations can be marred by misunderstandings of what is to be provided by each of the participants, unhappiness with a slow collaborator, disagreement about what and when to publish, or conflicts regarding authorship and credit (Cohen, 1995).

### *Application in an International Setting*

The focus of this training is to gain familiarity with international collaborative research. International collaborative research requires not only the collegiality required during domestic collaboration, but also greater regard to communication and the consideration of the unique demands that accompany working across cultural contexts, languages, and unfamiliar research environments.

#### *Collaboration in an international setting may require:*

- Identifying social, economic, and political factors that may affect research practices in different countries.
- Articulating ethical principles for conducting collaborative research with international research partners.

#### *Researchers engaging in international collaboration should:*

- Identify effective ways to negotiate with international research partners and resolve differences using knowledge of cultural context.
- Examine and question one's cultural biases in assessing the value of contributions from an international research partner.

## Conflicts of Interest & Intellectual Property

### *Definition*

Conflicts of Interest are not merely a hypothetical problem. Scientists have professional, fiduciary, and ethical interests in the responsible conduct of research, but the responsible conduct of research may be compromised by personal interest. Financial and non-financial interests that might conflict with the integrity of science include career advancement, publishable results, service to patients or students, fame, power, or family and friendships. If conflicts cannot be avoided, then those conflicts should be disclosed. These situations often occur when two or more competing interests create the perception or the reality of an increased risk of bias or poor judgment. Conflicts of interest are of serious concern regarding research integrity, as they can both undermine public trust and jeopardize scientific objectivity (Shamoo & Resnik, 2003: 193). The institution, funding agency, and any other parties with a significant interest should be made aware of the extent and nature of the conflict. According to Steneck (2007), the motivation for working hard may stem from the potential advancement of knowledge, discoveries that may benefit individuals or society, professional advancement, or personal satisfaction. Interests may become problematic as multiple or competing responsibilities affect the responsible practice of research. Such conflicts are not inherently bad. Indeed, they are to be expected given the multiple responsibilities of researchers and their research partners. How these conflicts are handled can lead to improper, inappropriate, or bad outcomes.

A common worry is that financial interest in the outcomes of research can result in unethical behavior or even criminal misconduct. However, it is also plausible that non-financial interests other than financial interests could compromise the responsible conduct of research. Examples of non-financial interests that might conflict with the integrity of science include career advancement, publishable results, service to patients or students, fame, power, or family and friendships. Another potential conflict can come in the form of conscience. An individual might suffer a conflict of interest, for example, if the mission or expectation of, for example, the institution is not compatible with his or her personal values.

### *Application in an International Setting*

Conflicts of interest in an international setting may include, but are not limited to, situations in which power differences access to financial support, access to a community, or unauthorized access to local knowledge may affect the process and outcomes of research. Within an international context, for researchers must remain vigilant regarding the variation among laws, policies, and codes of conduct related to the mitigation of conflicts of interests. This may also include willingness to communicate with appropriate local authorities who control the research process.

Disclosure of a conflict of interest is often not enough, particularly in international collaborations. For every step of the research process, attempts should be made to isolate the conflicted individuals from all decision-making functions, while remaining aware of the local conditions or cultural expectations influencing the conflict. Cultural context may influence how research with human subjects is conducted. Researchers in an international context must understand limitations on the ability of research participants in some countries to provide informed consent, as well as the broader societal impact of a research project on a given community.

### *3 Types of Conflicts of Interest*

1. Financial Conflict occurs when there is a financial interest that may affect bias during a research project or in some cases alter research findings. Although financial interests in a research project are not inherently unethical, conflicts of interest occur when the prospect of financial gain compromises intellectual honesty and research integrity.
2. Conflict of Conscience occurs when an individual might suffer a conflict of interest if the mission or expectation of an institution, funding agency, or research project is not compatible with his or her personal values.
3. Conflicts of Commitment occur when situations create competing demands on a researcher's time and loyalties. This differs from conflict of duties in which situations do not compromise a person's thought process or behavior. Unlike conflicts of commitment, conflicts of duties are not considered conflicts of interest (Shamoo & Resnik, 2003: 193).

## Publication Practices and Responsible Authorship

### *Definition*

Authorship signifies who deserves credit for the work being published. Those designated as authors also remain responsible for any deficits in the integrity or quality of the work. Authorship is the most visible form of academic recognition and credit. Authorship is also one of the primary means of advancement for many careers in academia. However, because credit for publication is also important in disputes and allegations of research misconduct, it is worth considering why authorship credit is more than a matter of personal gratification. Indeed, attribution of credit and responsibility is central to the structure of science. Research groups and collaborators should be clear about the criteria and plans for authorship; individual scientists should discuss authorship during the planning of any collaboration and continue those discussions as the research project evolves. Because authorship is a matter of public credit and responsibility, those and only those who have met accepted criteria for authorship should be included as authors.

The framework of science depends in part on the ability of institutions, policy makers, and the public to identify who is responsible for the work and its interpretation. Funding agencies consider past success, as evidenced by authorship, in the allocation of research grants. Research institutions often use authorship as evidence

of creative contributions that warrant promotion. Scientists themselves may use credit for past work as a mechanism to attract both new trainees and willing collaborators. Finally, in an era of increasing emphasis on commercialization, authorship and credit help to define intellectual property rights. These and other reasons explain scientists' desire for the credit of authorship, and reiterate the importance of responsible authorship in international research and collaboration.

### *Application in an International Setting*

Ownership of intellectual property and credit for that knowledge may have several different meanings across different cultural contexts. These differences may require negotiation with research partners regarding expectations when collaborating on research and resulting publication. Authorship in an international setting demands a broader definition of the term, especially when language barriers require the facilitation of research through the knowledge and skill of a translator. Cases in which contributors vital to the collection of data but not identifiable as a primary researcher or research partner may require other formal acknowledgement procedures, which may depend heavily on cultural expectations regarding reciprocity and recognition.

In order to better understand the meaning of authorship in different cultural contexts, researchers must understand the rules of professional etiquette and research practice in all the countries they conduct research. This may require negotiating the definition and limits of authorship with research partners or confronting differences concerning deference to authority, language-barriers, levels of responsibility, and intellectual property.

### *5 Types of Authorship*

Co-Author is any person any author of a publication other than the one listed first. According to Berk (1988), "Co-authorship requires the coauthor to have made a substantial and specific intellectual contribution to the work. It indicates active participation with thought and effort, and it guarantees that the coauthor has the ability to defend the results and that he or she assumes responsibility for them.

Authorship by Contribution assigns authorship by the order of relative contribution to the research project and/or final publication (Florida State University Graduate School, 2013).

Gift Authorship is the act of acknowledging someone as an author, despite their lack of active involvement in the research project, for the sole purpose of gaining favors from the individual for professional gain.

Honorary Authorship is the act of acknowledging someone as an author out of respect or gratitude despite the active involvement of the honorary author in the research project's design, implementation, and publication.

Ghost Authorship is the act of participating in the writing of a manuscript despite no involvement in the planning or conducting of the research from which the manuscript is based (Shamoo & Resnik, 2003).

## Data Management

### *Definition*

Data management includes the integrity, quality of collection through planning and the selection, and analysis of the data. Data is defined here as measurements, observations, or any other primary products of the research activity. Data, which provide a factual basis for inference, conclusions and publication.

Data management includes several skills and activities including, but not limited to, proper methods of record-keeping and electronic data collection, storage of scientific research, and the sharing of data. Issues when managing data include defining what constitutes data; keeping data notebooks or electronic data; defining privacy and confidentiality; and data selection, retention, ownership, and data as legal documents and intellectual property, including copyright laws. In order to effectively manage data, everyone with a role in research has a responsibility to ensure the integrity of the data. The integrity of research depends on the integrity of data management, including the collection, use, and sharing of data. The ultimate responsibility of data management belongs to the principal investigator; however, anyone who participates in planning the study, collecting the data, analyzing or interpreting the research findings, publishing the results of the study, or maintaining the research records is also responsible.

An open data policy benefits science by increasing the likelihood for new insights, collaboration, and reciprocal sharing. Proper and documented data management strategies also provide a baseline from which to replicate the experiment, verify results, and foster debate. The acknowledgement of bias during the collection process and the honest reporting analysis of data is vital to the reliability of findings. Data management also requires vigilance regarding the usage and storage (Office of Research Integrity, 2012).

Concern about research misconduct was a primary motivation for a 1990 conference on data management sponsored by the Department of Health and Human Services. One of the outcomes of that conference was a summary of the many ways in which the responsible conduct of research depends on responsible data management, including guidelines appropriate for experimental design, and protocol approval. This includes:

- Recordkeeping in a way that ensures accuracy and avoids bias
- Guiding criteria for including and excluding data from statistical analyses
- Specifying responsibility for collection, use, and sharing of data.

### *Application in an International Context*

Data management in an international research setting may require special consideration of cultural, political, and economic contexts, which may shape views on information sharing and data access. It remains important to show sensitivity to differential access to materials or technology (e.g., issues of waste, unreliable internet access, etc.). Open communication about the expectations surrounding both the

collection and sharing of data is especially important in the international context, since local practices and local authorities may dictate the research process. One of the particular challenges of data management in an international context is the potential lack of transparency regarding data accessibility due to national protocols, policies, political concerns, or the potential for social harm if some information is readily accessible.

### *Types of Data Management*

Data Acquisition or Collection is the process of gathering raw data and the observation of both reliable data collection methods and necessary approvals required prior to data collection. Researchers may require authorization from an institutional review for the collection of data using human or animal subjects in research. Recording the data is the last physical step of the data collection process and requires the accurate recording of dates of observation and validation practices if data was collected electronically {Steneck, 2007}.

Data Protection is the responsible handling and storage of data particularly as the data is exchanged by the researchers in the collaborative research process. Data protection includes the proper back-up of electronic data, as well as ensuring safe physical storage of data and the reduction of risks related to fire, flood, and other catastrophic events. Proper storage practices also include the retention of the data for an extended period of time in order for possible future use or validation and the protection of sensitive data related to research subjects.

Data Sharing is defined as the free exchange of information and may include the publishing of significant findings or the sharing of raw data in order to replicate a study or create an original research project {Columbia Center for New Media Teaching and Learning,2013}.

## A3. Virginia Tech Syllabi for General and Specific Research Ethics Training

The document presented here comprises the Overview and Weekly Schedule sections from a syllabus for Grad 5014: Ethics & Scholarly Integrity, and the Course Objectives and Course Topics sections from a syllabus for Grad 5404: Research in International Contexts.

### Grad 5014: Ethics & Scholarly Integrity

#### *Overview*

Our class this semester is a joint venture to better understand the topic of academic integrity in a graduate school setting, which comprises several different elements. We can talk about plagiarism, of course, but also research conduct, professional citation codes, and your own experiences in your different disciplinary practices. In fact, your participation in the course lies at the heart of our discussion, from the questions we'll ask to the assumptions we examine. We might begin with the following:

- What does it mean to have integrity? Who decides?
- How is integrity different in academia versus other areas of society, such as industry or our own private lives? What does it have to do with fairness, equity, and values?
- What are the assumptions we make about integrity? About its context in academia?
- And how do different cultures think about academic integrity?

Why should you care about this topic? Exploring this topic will help you better understand why academic integrity is a central foundation of higher education and why it should matter to you. More importantly, it will help you learn more about yourself as a scholar and person of ethics.

Since this course is being offered for the first time this semester, we'll be looking to you all to help us identify those elements of the class that are most successful and to suggest things we might change in the future.

#### *Weekly Schedule*

Below is a tentative schedule of topics we'll cover this semester. However, depending on your interests and experiences, these may change.

Weeks 1-3	Defining Academic Integrity
Weeks 4-5	The Virginia Tech Honors System
Weeks 6-9	Disciplinary Methods of Citation
Weeks 10-12	Ethics and Personal Ethos
Weeks 13-15	Final Project

## GRAD 5404: Research in International Contexts

### *Course Objectives*

This 3-credit seminar is intended to prepare graduate students for an international research or similar experience and to enable them to maximize the professional and personal benefits of that experience. Students seeking the Graduate Certificate in International Research Abroad are required to take this seminar with “A-F” grading. Other students may also enroll.

- Having successfully completed this course, the student will be able to:
- Compare and contrast legal environments for research in the US and other countries
- Summarize key points in US and international intellectual property, trade, and copyright law
- Describe implications of export control regulations for research endeavors
- Apply principles of research ethics within international contexts
- Describe major sources of research funding in multiple countries
- Identify requirements for protection of human or animal subjects
- Describe higher education systems and research contexts in multiple countries
- Initiate an international research abroad project

### *Course Topics*

Topics to be covered are listed below (with approximate percentage of the class devoted to each topic).

- Legal environments of international research (15%)
- US and international intellectual property, trade, export, and copyright law (20%)
- Research ethics and protection of research subjects in international contexts (15%)
- US and international sources of funding for international research (15%)
- US and international higher education and research systems (15%)
- Cultural dimensions of international collaborations, including expectations for work-life balance, gender relations, and other aspects of cultural diversity (10%)
- Logistics of preparing for research abroad, including visas, health requirements, local culture, developed vs. less developed countries, and technology and tools for collaboration across cultures (10%)

## Appendix B

# Sample Learning Outcomes

## B1. Emory University Sample Learning Outcome Plan

By the time they complete their course of study, students should be able to/are expected to:

	Knowledge	Skill	Attitude	Target for Measure
Cultural Context	Compare the relationship between students and research supervisors at partner institutions.	Take into account contextual information when making judgments about what is right or wrong.	Respect cultural differences and areas of cultural sensitivity.	
Research Practices	Identify differences in national or cultural norms regarding authorship order and other formal acknowledgement procedures.	Examine and question his or her cultural biases in assessing the value of contributions from an international research partner.	Convey concern for different cultural approaches to establishing trust among international research partners.	
Ethical Frameworks	Identify common ethical challenges that arise in international research collaborations in one's field.	Formulate and analyze alternative ways to solve an ethical problem in international research.	Acknowledge that the "right" decision in one country may lead to unintended ethical consequences in another.	

Continued:

	Knowledge	Skill	Attitude	Target for Measure
Assessment Methods	Pre-test/ post-test survey	Pre-test/ post-test survey	Pre-test/ post-test survey	Positive change in > 80% of students
	Ethical Decision-Making Measure (Mumford et al.)	Ethical Decision-Making Measure (Mumford et al.)	Ethical Decision-Making Measure (Mumford et al.)	Minimum proficiency demonstrated in 3/4 dimensions of ethicality by 80% of students
	Case Analysis Exercise*	Case Analysis Exercise	Case Analysis Exercise	Appropriate identification of at least one KSA in each case by 86% of students
* While all assessment methods measure all the knowledge, skills, and abilities listed, the assessment is highlighted in the column of the target measure.				

## B2. Virginia Tech Learning Outcomes and Assessment Strategies for Ethics in IGEP Courses

### Learning Outcomes for Ethics in IGEP Courses

Students will compare differences between lab cultures in their lab exchange assignment, including different approaches to authorship, lab notes, and citation styles.

Students will review the text “On Being a Scientist” and assess how the norms laid out there in compare to their own experiences.

Students will develop a presentation of differences and best practices for an aspect of scholarly integrity and ethics.

Students will investigate different methodologies from within the interdisciplinary group, including, for example, qualitative, quantitative, and experimental practices, and will be able to articulate the strengths and limitations of each.

Students will synthesize their knowledge of ethical challenges within and normative differences between labs.

Students will reflect on the ways their work impacts society and policy.

Students will demonstrate an understanding about current challenges (funding, intellectual, and sociotechnical) in the IGEP I IG ERT field by reading and reporting on current I recent National Academy of Science decadal surveys of the field.

Students will propose a new interdisciplinary IGEP/IGERT and develop the rationale and justification for this program in light of current challenges in their respective fields.

### Assessment Strategies for Ethics-Related Learning Outcomes for IGEP Courses

Students’ ability to compare lab cultures will be assessed based on a class presentation that compares and assesses each culture’s approach to relevant issues of scholarly integrity and ethics.

Students’ understanding of current scientific norms and values will be assessed during a discussion of the text “On Being a Scientist” and other relevant material.

Students’ synthesis of knowledge about ethical challenges and normative differences will be demonstrated through a short paper presentation comparing them.

Students will demonstrate and ability to synthesize their experiences in different labs through a final examination with questions created by the group.

Students’ knowledge of interdisciplinary and related ethical challenges will be articulated in a short paper.

Students' will keep a blog throughout the semester, both on assigned topics of interest as well as their own reflections on their understanding of ethics and scholarly integrity.

Students will present on their research and explore issues of policy implications and societal responsibility derived from their work.

# Appendix C

## Student Survey Data

The following tables are those referenced in Part IV of this monograph.

Table 1a. General Research Ethics Awareness and Participation by STEM/ Non-STEM Status and International Experience								
	2013				2015			
	STEM		Non-STEM		STEM		Non-STEM	
	Intl Exper	No Intl Exper						
Face-to-Face course(s)	67%	56%	72%	68%	75%	60%	75%	71%
Online course(s)/Websites	38%	42%	44%	46%	49%	44%	50%	49%
Orientations (program or institution)	66%	54%	62%	56%	82%	69%	78%	69%
Brownbag(s)/Informal discussions and workshops	41%	30%	45%	35%	48%	69%	50%	35%

*Data Sources: 2015 CGS Graduate Student Survey and 2013 CGS Graduate Student Survey.*

Table 2a. International Research Ethics Awareness and Participation by STEM/ Non-STEM Status and International Experience								
	2013				2015			
	STEM		Non-STEM		STEM		Non-STEM	
	Intl Exper	No Intl Exper						
Face-to-Face course(s)	17%	8%	27%	11%	27%	7%	27%	13%
Online course(s)/Websites	12%	8%	17%	6%	25%	8%	25%	11%
Orientations (program or institution)	20%	8%	23%	10%	34%	10%	38%	14%
Brownbag(s)/Informal discussions and workshops	12%	6%	17%	6%	22%	5%	25%	8%

*Data Sources: 2015 CGS Graduate Student Survey and 2013 CGS Graduate Student Survey.*

Tables 1a and 2a indicate that all students, regardless of STEM study or international experience, reported an increase in awareness of, and participation in, resources and activities related to general research ethics for virtually each type of activity from

2013 to 2015. They also indicate that students with international experience reported the highest awareness of, and participation in, resources and activities related to international research ethics in both 2013 and 2015.

**Table 3a. Student Confidence in Ethics by STEM/Non-STEM and International Experience**

	2013				2015			
	STEM		Non-STEM		STEM		Non-STEM	
	Intl Exper	No Intl Exper						
Not confident	14%	30%	12%	39%	14%	30%	18%	35%
Somewhat confident	59%	56%	59%	48%	60%	55%	51%	53%
Very confident	27%	14%	29%	14%	26%	15%	31%	12%

*NOTE: Excludes respondents who did not provide an answer to the questions.*

*Data Sources: 2015 CGS Graduate Student Survey and 2013 CGS Graduate Student Survey.*





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ISBN-10: 1-933042-48-6  
ISBN-13: 978193304280