

Rationale

In 2005, during its first round of competition, the NSF Ethics Education in Science and Engineering initiative gave award #0530217 to a collaboration of eight land grant and Historically Black Colleges and Universities: North Carolina A&T State U., NC State, NC Central, Fayetteville State, Wisconsin, Purdue, Iowa State, and Hawaii. The project is called a “Model Curriculum for Land Grant Universities in Research Ethics,” or LANGURE. By the end of its last year (2007-08), LANGURE will have successfully completed the first step of a three-step vision to institutionalize the teaching of research ethics across the public university systems of five states: North Carolina, Wisconsin, Indiana, Iowa, and Hawaii. The centerpiece of the LANGURE effort has been the development of a new one-credit, doctoral-level, curricular intervention known as Research Ethics *Education* (REE) and embodied in a free online course, the OpenSeminar in Research Ethics.

The project proposed here, “Extend and Assess Research Ethics Education” (EAREE) will build on LANGURE’s successes. EAREE is designed to accomplish the second of the three steps in our vision, namely, to *extend* the research ethics education vision by teaching OpenSeminar at all of the doctoral-degree granting universities in North Carolina and *assess* its effectiveness across an entire state research system. We leave for the future plans to take the third and final step, teaching OpenSeminar at all of the doctoral-degree granting universities in all five of LANGURE’s states.

The OpenSeminar course was developed by a team of graduate faculty led by Archibong, Comstock, Alston-Mills, and Grant, among others. This leadership team saw a need for an alternative solution to what is commonly known as Responsible Conduct of Research (RCR) training. They designed OpenSeminar around the idea that Research Ethics Education should aim primarily at welcoming graduate students into the community of scholarly inquirers. We believe, in other words, that graduate students should first be introduced to mentors and peers who will inspire and hold them accountable before they are expected to memorize extensive rules and regulations. The result, OpenSeminar, is a ground-breaking 1.0 credit doctoral-level course consisting of 14 total hours: 10 hours of a common core for all students, plus 4 more discipline-specific hours that address the social responsibilities of professionals. We describe the OpenSeminar in more detail below.

EAREE is an education and research initiative, the nation’s first to disseminate a standardized, interdisciplinary, inter-institutional, communally-oriented collaborative online course in research ethics to all of the doctoral-degree granting institutions in a state university system.

EAREE will also conduct a scientifically controlled longitudinal study to *assess* the effectiveness of OpenSeminar with experimental and control groups of graduate students enrolled and not enrolled in the course.

We start with a history of the EAREE project, beginning with a description of the RCR training approach and the response to it found in LANGURE. The PIs find four potential problems in RCR training, centering on its: 1) effectiveness; 2) diagnosis of the problem; 3) philosophical coherence; and 4) comprehensiveness.

A first potential problem in RCR training is its effectiveness in preventing misconduct by graduate students and faculty. The three co-PIs on the LANGURE grant were unable to find a single long-term, inter-institutional, longitudinal, scientifically-controlled study of RCR effectiveness. Anecdotal evidence about RCR effectiveness is not assuring. Fifty percent of all graduate physical sciences students in the US admit to having cheated in the last year, as do fifty-four percent of all graduate engineering students (McCabe, et al., 2006; cf. Wajda-Johnston, et al., 2001). Forty-four percent of faculty witnessing cheating in the three years prior to 2005 did not report one case to the appropriate institutional authority (McCabe, 2005).

The research establishment is acutely aware of the problem. In recent years, institutions have joined NIH and NSF in highly-publicized and well-funded initiatives to create new RCR interventions. For example, the Council of Graduate Schools (CGS) recently made eighteen awards to member institutions totaling hundreds of thousands of dollars (CGS website, 1 April 2007) to develop Graduate School administrators with expertise in RCR. With increasing numbers of universities providing RCR training to graduate students, one would expect a corresponding decrease in misconduct reports. However, the number of institutions reporting misconduct cases to the Office of Research Integrity continues to rise, from 40 in 1992 to 62 in 2001 (ORI, 2006). The nation's foremost authority on the study of cheating in universities, Dr. Donald McCabe of the Center of Academic Integrity, infers from his data that the incidence and cultural acceptance of misconduct is increasing (McCabe, et al., 2006; Griffin 2007; cf. Callahan 2006).

A second weakness in RCR is its diagnosis. RCR instructors often identify the problem as a lack of knowledge by students of research norms, requirements, policies, and regulations. Typical is the concern expressed by CGS, "that many, if not most, students, postdoctoral fellows, technicians, and even faculty, arrive in the laboratory not fully informed about the norms of science, the ethical requirements of research, or the policies and regulations that govern research in the U.S." But is this diagnosis correct? Is the problem a lack of information? Or is it a lack of personal empowerment and investment in the community?

A third area needing attention is the philosophical foundation of RCR. Pimple (2002) alleges that RCR training is philosophically incoherent because it typically consists of a sequence of different experts who lecture on regulations in different areas but the connections between these areas is not coherently stated. The co-PIs go further. Archibong and Boyd-Williams, along with Comstock, Alston-Mills, and Grant (2007) question whether RCR's goals of rule-following and compliance with regulations is compatible with the basic principles of research: critical inquiry and skeptical questioning.

The fourth problem in traditional RCR training is its comprehensiveness. RCR training is not designed to raise the broader questions of the social responsibilities and global challenges of tomorrow's professionals. Hence, discussions of plagiarism, and falsification and fabrication of data are critical, but sometimes these discussions delay or even prevent discussions of broader ethical questions. Time is needed in these interventions for honest, probing analysis of the basic political and environmental duties of student and faculty researchers.

LANGURE addresses these four problems, seeing them as opportunities to effect critical and substantial change.

LANGURE addresses the first problem of effectiveness by drawing on two millennia of experience in the Socratic method of teaching ethics. All students enrolling in the OpenSeminar must first introduce themselves and find mentors and peer partners with whom to interact. In this way, each and every student is welcomed into a vibrant community of inquirers. As part of a community, young scholars feel safe to ask difficult questions—questions that may be academically, culturally, and politically threatening. They know they have allies who will support, inspire, challenge, and defend them. The Socratic method holds that students acculturated into and inspired by thriving communities of inquiry will autonomously adopt scholarly rules for themselves.

LANGURE addresses the second, diagnostic, problem by adopting a social learning approach to improving students' abilities in moral reasoning. Although evidence is still limited, recent investigations find programs that use a variety of interactive pedagogies (narratives, role-playing, debates) are more successful than those that aim primarily at teaching norms and complying with rules (Fischer and Zigmond, 2001 cited in Eisen and Parker, 2004; Rossett, 2004). In addition, programs that provide useful heuristics for "systematic moral analysis" are more effective than those that do not (Elliot and Stern, 1996 cited in Pimple, 2001). Couger

(1989) found that students are most interested in ethical questions that directly affect them. Examples of such questions include whether one has an obligation to purchase two copies of the same software if one owns two computers. Following on these results, the OpenSeminar begins with a narrative case study of a group of graduate students at the U. of Wisconsin who exhibit courage and integrity in the face of a faculty mentor who has mislabeled photographs in a grant application.

LANGURE addresses the third, coherence, problem by basing its pedagogical approach on a tested method in teaching moral philosophy: the expanding moral circle. Starting with egoistic self-interest as a way to answer the students' usually unspoken but deeply felt question, "Who cares?" the OpenSeminar begins by showing students the harm that can come to them if they do not care. Students then come to recognize that their moral circle extends beyond themselves to include their local group and professional peers and, indeed, all people. OpenSeminar, therefore, does not primarily aim to inform students but to acculturate them into their research groups, networking them with their own research communities.

LANGURE addresses the fourth problem of comprehensiveness by developing discipline-modules on the social responsibilities of researchers in the fields in which NSF conducts research:

Agricultural biotechnology and sustainability; Agricultural extension; Use of animals for food and fiber; Biomedical engineering; Business communication; Chemistry; Civil engineering; Construction engineering; Computer science; Computer privacy; Design; Electrical engineering; Ecology; Human subjects in social science research; Intellectual property; Mentoring, women and under-represented minorities; Microbiology; Nanotechnology; Nuclear engineering; Physics; Privacy; Psychology; Sociology; and Statistics.

The project proposed here, EAREE, will build on LANGURE's successes, organically extending the work of LANGURE by establishing in one of LANGURE's five states a state-wide system of collaborators in research ethics education. Casting its lot with interactive learning theory, narrative case studies, experimental moral philosophy, and a heuristic approach to ethics pedagogy, EAREE aims primarily to develop Socratic skills of inquiry. Our goal is not to train students to comply with regulations--or even to "train" students at all. Rather, we electronically introduce them to supportive peers and mentors around the world, easing their way into a virtual environment in which they are free, indeed expected, to question. We wager that in the new vision, young scholars will not only be more productive as individuals. They will also stimulate increased group productivity. The research environment is inherently more efficient when leaders have introduced newcomers to discipline-specific narratives of moral achievement (heros) and failure (heels); acculturated them into relationships of trust and collaboration; encouraged them to take risks; held them mutually accountable to each other; and led them in discovering the intrinsic rewards of research. Those are EAREE's goals.

OpenSeminar has been constructed to solve the four problems of RCR training. In just three months of existence, the online course is already proving to be enormously useful. The website opened on Jan 15, 2007 with eight instructors opening sections: one course at each of the eight LANGURE institutions. In the intervening three (3) months, with little or no advertising, fourteen (14) additional instructors have opened sections at these universities: Duke, East Carolina, IIT, Penn State, Nebraska, UNC-Chapel Hill, UNC-Charlotte, UNC-Greensboro, UNC-Wilmington, U. California-Davis, UC-San Diego, U. North Texas, U. Tennessee-Knoxville, and U. Texas-Austin. To our great surprise, instructors at five (5) universities outside the US have opened sections: Hokkaido U. (Japan), Moscow State (Russia), Universidad de Concepcion and the U. of Chile (Chile), and U. Puerto Rico-Mayaguez. New requests for sections come in weekly. One can hardly imagine a more compelling argument for continued investment in and expansion of LANGURE's OpenSeminar.

EAREE takes OpenSeminar to the next level, extending its bases on the two UNC doctoral-degree granting LANGURE campuses—NC A&T and NC State—to the remaining five UNC doctoral campuses: East Carolina, UNC-Chapel Hill, UNC-Charlotte, UNC-Greensboro, and UNC-Wilmington. The result will be a standardized research ethics curriculum across the graduate curriculum of an entire state university system and a curriculum evaluated for its effectiveness.

Project Plan

Goals

EAREE has three overarching goals:

- a) Extend LANGURE's "OpenSeminar in Research Ethics" course to all seven of the doctoral universities in the University of North Carolina system;
- b) Assess the effectiveness of the OpenSeminar in achieving its pedagogical goals at these seven universities;
- c) Establish a mechanism and template for extending the OpenSeminar to other state systems.

Deliverables

The project will produce nine deliverables:

- Seven doctoral students ("Junior Research Ethics Fellows") recruited and thoroughly trained over two years as collaborators in researching, developing, testing, implementing, and documenting the effectiveness of, the OpenSeminar in Research Ethics;
- Ten graduate faculty and Graduate School administrators ("Senior Research Ethics Fellows") at all seven of UNC's doctoral-degree granting universities collaborating with the Jr. Fellows to teach the OpenSeminar;
- Scientifically designed experimental testing of the effectiveness of OpenSeminar in achieving its learning outcomes of doctoral students enrolled and not enrolled in OpenSeminar in the UNC system;
- An initial workshop for participants preparing to teach the OpenSeminar in Year 1, Fall term;
- An online version of OpenSeminar to broaden participation in the intervention by other state research systems;
- A workshop in Year 2 for participants to evaluate Year 1, make course corrections, prepare to teach in Year 2;
- A final workshop in Year 3 for participants to evaluate the individual courses and overall project;
- Broad participation by hundreds of doctoral students in the OpenSeminar;
- A document explaining the mechanism and template for other state systems to adopt OpenSeminar.

Methods

We employ three basic methods to accomplish the aforementioned goals:

- a) Create a state-wide network of UNC graduate institutions teaching a standardized REE curriculum;
- b) Test the adequacy and effectiveness of OpenSeminar to address the needs of a diverse set of doctoral granting public institutions;

- c) Scientifically assess the effectiveness of the educational intervention with experimental subjects enrolled and not enrolled in the OpenSeminar.

Strategies

Our strategy is to teach and evaluate OpenSeminar across the UNC system, that is, on all 7 of EAREE's campuses. As previously explained, the historical roots of EAREE are in LANGURE. The first interdisciplinary, inter-institutional national network of eight land grant universities (LGUs) and Historically Black Colleges and Universities (HBCUs) teaching research ethics, LANGURE is currently preparing to host a major international workshop entitled "Research Ethics *Education*: Beyond RCR Training," April 12-14, 2007. As of today, April 5, 2007, more than 150 participants are registered, including faculty members and graduate school administrators from across the United States and Japan, China, Russia, Spain, Chile, and Puerto Rico. LANGURE was not expected to become a multi-national project, but OpenSeminar has clearly struck a chord in the international community. While the OpenSeminar is not yet even completed, the course is already being translated into four languages: Spanish, Russian, Chinese, and Japanese. When these efforts are completed, thousands of graduate students around the world will be using the site in their native tongue.

EAREE will build on the national network established by LANGURE. We do not, however, propose to over-reach, trying to build large networks that cannot sustain themselves. Rather we propose to grow organically, firmly rooting the OpenSeminar in one of LANGURE's five states. Beginning from our two bases at NC A&T and NC State University, we have commitments to OpenSeminar from ethics and graduate school administrators at the remaining five doctoral UNC institutions:

East Carolina University, ECU	Professor David Musick
University of North Carolina at Chapel Hill, UNCCH	Professor Douglas MacLean
University of North Carolina at Charlotte, UNCC	Professor Steven Rogelberg
University of North Carolina at Greensboro, UNCG	Professor Terrance McConnell
University of North Carolina at Wilmington, UNCW	Professor Candace Gauthier

The institutions are diverse in size, graduate education and research emphases, and student body composition. They include at least one representative from each of the four Carnegie graduate classes: Research extensive, Research intensive, MA I, and MA II. As the cost of tuition at each institution also varies, the campuses differ in their accessibility to low income students. For example, graduate tuition for the UNC—Chapel Hill is more than three times that of NC A&T, resulting in a diversity in the socio-economic background of the graduate students on the campuses.

The EAREE faculty at each campus will collaboratively prepare, teach and evaluate the course, testing the ability of OpenSeminar to meet the needs of students and faculty conducting research in all of the fields in which NSF sponsors research.

The EAREE initiative will use the OpenSeminar developed by Archibong, Comstock, Alston-Mills and Grant with previous NSF support. The OpenSeminar is a free online 1.0 credit collaborative course developed by LANGURE for graduate students in engineering and the life, physical and social sciences. The course has four objectives: acculturate young scholars into communities of critical inquiry; integrate them into peer and mentoring relationships for mutual support and accountability; guide them in forming personal research identities by sharing their discipline's narratives of moral achievement and failure; require them to ask difficult questions about their social and global responsibilities. The OpenSeminar consists of fourteen contact hours: ten hours of a common core for all students, plus four additional, discipline-specific hours. The additional hours are selected from a menu of modules developed by LANGURE. Each module is specifically designed for students in the fields NSF supports: physical sciences, biological sciences, engineering, and social sciences (Figure 1). Some of the OpenSeminar modules, including "Women and underrepresented minorities students

in graduate education” and “Statistics,” address issues of such universality and urgency that they are incorporated into the core course itself.

EAREE’s strategy is to engage students by beginning with ethical problems that relate directly to their current experiences as graduate students. The initial engagement will be followed by modules designed to promote growth in moral reasoning and analysis, maintain their interest, and increase their knowledge of the scientific and engineering communities’

EAREE is convinced we serve tomorrow’s researchers best by treating them as young scholars. If LANGURE’s hypothesis is correct, RCR training across the various disciplines and various campuses must: (1) Be thoroughly revised to build trust and respect among peers and mentors; (2) Empower students to pursue their work with personal integrity; and (3) Stimulate them to raise broader ethical questions about their research.

Recruitment

The EAREE initiative is supported by the Office of the Dean of the Graduate School on each of the five new campuses. Recruitment efforts will be a joint effort between the respective Graduate School administrations and EAREE personnel. Graduate students will be strongly encouraged to participate by either taking the OpenSeminar or by participating as a member of the control group. Students in the control group will receive an honorarium of \$100 for their help, payable upon completion of the last evaluative test.

Activities

The primary activities will be annual offerings of OpenSeminar, annual one-day workshops, and evaluation studies. In Fall term of Year 1, the Senior Fellows (faculty) and Junior Fellows (graduate students) will gather at NC A&T for a one day workshop. The goals of the workshop will be to: 1) Develop, refine, and learn to teach the OpenSeminar, 2) Discuss recruitment for OpenSeminar, and 3) In Year 1, the course will be taught on each campus. In year two, the workshop will be held again in the fall and the course is taught. At the beginning of year three, each institution will review the course and, if satisfied, provide resources needed by the instructor to offer the course. A final workshop in spring of Year 3 evaluates the project. Table 3 shows a detailed timeline.

Table 3. Project Timeline

	Yr. 1 (2007-08)	Yr. 2 (2008-09)	Yr. 3 (2009-10)
August	➤ Grant notification ➤ Recruit Junior Fellows	➤ Plan second workshop.	➤ Begin registration for next workshop.
October	➤ Plan workshop.	➤ Plan workshop	➤ Plan workshop
November	➤ Workshop to plan Sp 98 OpenSeminar offering	➤ Workshop to assess 08 offering, plan 09 offering	➤ Workshop to assess 09 offering, and potential 2010 offering, EAREE activities.
December	➤ OpenSeminar preparation	➤ OpenSeminar preparation	➤ OpenSeminar preparation
January	➤ OpenSeminar begins on each campus	➤ OpenSeminar begins on each campus	➤ OpenSeminar begins on each campus
April	➤ Seminar ends	➤ Seminar ends.	➤ Seminar ends

May	➤ Seminar assessment	➤ Seminar assessment	➤ Project assessment activities. ➤ Seminar assessment
June	➤ Project assessment	➤ Project assessment	➤ Final Report to NSF.

NC A&T State University, which is both an Historically Black University and a Land Grant University is deeply committed to EAREE. It has committed salary support for Professor Archibong and for a graduate student research assistant. It is the ideal lead institution. In Nov 07, all Senior Fellows and Junior Fellows will gather there for the annual workshop. One Junior Research Ethics Fellow at NCA&T will provide research support as well as clerical and logistical support for workshop planning, execution, and evaluation. A second Jr. Fellow serves as Managing Editor of OpenSeminar.

Key personnel

EAREE capitalizes on the groundwork laid by LANGURE. To its credit, it has in Dr. Chi Anyansi-Archibong a full professor with years of leadership experience in team management, research ethics, and mentoring of women and under-represented minorities. Archibong has nurtured relationships of trust among the four other principals: Boyd-Williams, Alston-Mills, Grant, and Comstock. The four African-American women leading the team have demonstrated leadership in the mentoring of underrepresented groups in science and engineering; EAREE will exploit these relationships to enhance the recruitment of women and individuals from underrepresented groups into the STEM disciplines.

EAREE also benefits from the contributions of five highly-regarded moral philosophers strategically placed throughout the UNC system: MacLean at Chapel Hill; Musick at East Carolina; Terrance McConnell at Greensboro; Gauthier at Wilmington; and Rogelberg at Charlotte. This extraordinarily rich state-wide network of research ethicists provides a solid foundation for the development of EAREE's exemplary state-wide model, a model poised for exportation to other state systems in step three of our three-step vision.

EAREE's senior personnel have extensive background in research ethics and have worked together in the past on LANGURE. EAREE is an extremely ambitious effort relative to those RCR training initiatives confined to a single institution. To its credit, the project has a core group of individuals who share a common vision for curricular intervention at the graduate level.

EAREE's senior personnel are eager to help their institutions take the next step in research ethics education: to extend and assess LANGURE's new vision for research ethics education. All of the five principals except Boyd-Williams are Senior Personnel on the LANGURE project. We have already discussed LANGURE's accomplishments, but LANGURE has not, and was not intended to, accomplish either of these goals:

- 1) Demonstrate that OpenSeminar in Research Ethics can be effectively *extended* to serve the needs of a diverse set of campuses across a state-wide system;
- 2) Scientifically *assess* the learning outcomes of OpenSeminar taught across a state system by establishing control and experimental groups of students enrolled and not enrolled in the course.

While LANGURE has succeeded beyond anyone's dream in articulating, revising, and placing online the Research Ethics Education (REE) vision found in OpenSeminar, LANGURE was not designed to institutionalize ethics education across an entire state system. Apart from NC A&T State and NC State, the effort has not involved the major doctoral-degree granting campuses of the UNC system.

For this reason, the next step beyond LANGURE must be a targeted, carefully designed, inter-institutional effort in which the EAREE senior personnel work together with Graduate School administrators to broaden participation in the OpenSeminar in Research Ethics by doctoral students on UNC campuses in Chapel Hill, Charlotte, East Carolina, Wilmington, and Greensboro.

EAREE will be led by the PI, Dr. Chi Archibong, professor of management and LANGURE institutional leader at NC A&T. Serving as co-PIs will be Dr. Ayanna Boyd-Williams, Associate Dean of the Graduate School at NC A&T, and Dr. Brenda Alston-Mills and Dr. Christine Grant at NC State. Dr. Gary Comstock (NC State) will consult on all aspects of the project. The leadership team will be filled out by a senior ethicist on each of the five campuses: Dr. Douglas MacLean (UNC – Chapel Hill); Dr. Steven Rogelberg (UNC – Charlotte); Dr. David Musick (East Carolina); Dr. Terrance McConnell (UNC – Greensboro); Dr. Candace Gauthier (UNC – Wilmington). We now describe each person’s role and qualifications.

PI Dr. Anyansi-Archibong is the LANGURE Institutional Leader at NC A&T and has taught the OpenSeminar with doctoral students in Energy and Environmental Engineering. She assumes ultimate responsibility for the success of all phases of EAREE. Archibong has developed and taught LANGURE’s core course. She is a highly qualified leader with years of experience in teaching research ethics and leading large interdisciplinary and interinstitutional teams. The course was so successful that the Dean of the Graduate School is convinced that the university should require the course of every RA and TA. Plans are being discussed to require the course of all doctoral students. Dr. Archibong also discusses the OpenSeminar topics of land grant university values and introductory ethics during the RA/TA orientations each Fall. The campus is considering offering LANGURE’s discipline-specific modules in departmental seminars.

Co-PI Dr. Ayanna Boyd-Williams is Assistant Dean, Office of Graduate Studies, at NC A&T. She specializes in professional development for graduate students, leading an orientation workshop each fall under the auspices of NCA&T’s Academy of Teaching and Learning.

Co-PI Dr. Brenda Alston-Mills, professor of animal science and assistant dean for diversity in the NC State College of Agriculture and Life Sciences, and she has lectured nationally on the topic “Women and Minorities in Science”. She teaches a first year inquiry class that stresses critical thinking skills. Dr. Alston-Mills has had several grants from the USDA Challenge Grants Program and USDA Scholars Program. She has directed programs aimed at fostering the inclusion of women and URM students in the agricultural sciences by using undergraduate research as a path. Alston-Mills is on the Board of a program that helps to recruit and retain URM students, the Bridge Program (described below). She has authored more than 40 publications, including “Profile of an Uphill Battle” (2003), a discussion of the challenges affecting women and URM students in science. Dr. Alston-Mills will spend ½ day each fall planning the annual workshop; 1 day participating in the workshop; and ½ day evaluating it. As author of the Women and Under-represented Minorities LANGURE module, her participation is key to EAREE’s success.

Co-PI Dr. Christine Grant, professor of chemical engineering, is the recipient of the National Science Foundation’s 2003 Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring (PAESMEM). Grant’s research evaluates interfacial mechanisms that control adsorption and desorption of thin films. One of only six tenured African-American women faculty members in chemical engineering nationwide, her outreach activities serve students from K-12 through graduate education. She includes students in her research agenda, giving additional attention to the mentoring of junior faculty. Dr. Grant has built an array of activities that seek to stop leaks in the academic pipeline for women, young faculty and students from traditionally underrepresented minority groups and teaches students how to work within the system. Dr. Grant will spend 1 day participating in the workshop; and ½ day evaluating it. As co-PI of the LANGURE grant, it is vital that she participate in EAREE.

Co-PI Dr. Gary Comstock will join Dr. Archibong in assuming responsibility for the success of all phases of the project. Comstock’s participation is critical to the success of the project because he is the PI for LANGURE, has extensive relationships with all of the principals, and has unparalleled experience working with Graduate School administrators to institutionalize the teaching of research ethics. Professor of philosophy and director of the Research and Professional Ethics Program at North Carolina State University

for the past 5 years, Comstock leads LANGURE along with Grant and Alston-Mills. Under his leadership LANGURE developed the OpenSeminar. In four (4) years, Comstock doubled the number of doctoral students taking “Research Ethics” four (4) times: from **3 students** in 2002-03 to **65** students in 2006-07.

Comstock also approached the NC State Administrative Board of the Graduate School (ABGS) with a resolution from the NC State University Graduate Students' Association (UGSA). The UGSA recommended that research ethics be required for all NC State doctoral students. The ABGS issued a response strongly encouraging, but not requiring, research ethics. It also added an item to program external review asking each department to describe the research and professional ethics training it provides. Comstock brings extensive experience with graduate school administrators to EAREE. His detailed knowledge of this area is a critical resource for EAREE as it begins to approach the administrations of other NC graduate schools. Comstock has an offer from Fritz Schmuhl, Philosophy Editor of Springer Publishing Company to publish the OpenSeminar materials. Stephanie Bird, editor of one of the leading journals, *Science and Engineering Ethics* has expressed interest in publishing a special number of the journal with papers from the LANGURE and EAREE projects. Comstock has accepted a two-year Resident Fellowship at the National Humanities Center (NHC) during the academic months of 2007-08 and 08-09, and will work on the book manuscript, journal project, and other EAREE responsibilities primarily in summer months.

Dr. Candace Cummins Gauthier (UNCW) and is professor of philosophy in the Department of Philosophy and Religion at the University of North Carolina Wilmington. She is the author of “Respect for Autonomy and Moral Responsibility: Meeting the Communitarian Challenge,” *Kennedy Institute of Ethics Journal*, 10:4 (2000) 337-352; and “News Media Coverage of National Tragedies: Public Discourse as Public Grieving,” *International Journal of Applied Philosophy*, 17:1 (2003) 33-45. Gauthier has been teaching at UNCW since 1986, including courses in Ethics, Bioethics, Media Ethics, and Research Ethics. She has been a voting member of the New Hanover Regional Medical Center Institutional Review Board since 1990. She was also asked to convene a committee to develop policies, procedures, and forms for an Institutional Review Board at UNCW and has served as the IRB chair since its inception in 1990.

Dr. David Musick (ECU) is Associate Dean, Medical Education and Clinical Associate Professor, East Carolina University Department of Physical Medicine and Rehabilitation. His areas of research interest include medical ethics, testing & evaluation issues in education; biomedical ethics; and spirituality in medicine. Musick, a skilled evaluator of ethics education programs will assess all EAREE activities. He will conduct IRB approved, impartial, blind surveys with all enrolled students before and after they take OpenSeminar. He will also conduct surveys with a statistically valid control group of students not enrolled in OpenSeminar. He will submit his findings to a leading journal, such as *Journal of Empirical Research on Human Research Ethics*.

Dr. Douglas MacLean (UNC-CH) is professor of philosophy at UNC–Chapel Hill. His research focuses on practical ethics and issues in moral and political theory that are particularly relevant to practical concerns. Most of his recent writing examines how values do and ought to influence decisions, both personal decisions and government policies. His publications on these topics include: “Comparing Values in Environmental Policies: Moral Issues and Moral Arguments;” “Cost-Benefit Analysis and Procedural Values;” and “The Ethics of Cost-Benefit Analysis: Incommensurable, Incompatible, and Incomparable Values.” He collaborates with Comstock on the Advanced Life Science Ethics Institute funded by NSF’s initiative, Ethics and Values Studies Program.

Dr. Terrance McConnell (UNCG) is professor of philosophy at the University of North Carolina Greensboro. He is the author of articles on whistleblowing, informed consent, and moral dilemmas and of three books: *Inalienable Rights: The Limits of Consent in Medicine and the Law* (New York: Oxford University Press, 2000); *Gratitude* (Philadelphia: Temple University Press, 1993) and *Moral Issues in Health Care*. He has taught many classes in applied ethics and ethical theory, including courses on medical ethics, ethics and genetics, cultural diversity, and ethical issues in biotechnology.

Dr. Steven Rogelberg is Professor of Organizational Science and Professor of Psychology at the University of North Carolina at Charlotte where he serves as Director of Organizational Science, Director of Industrial and Organizational Psychology, and is the Founder/Director of the Organizational Science Consulting and Research Unit. He has over \$300,000 of external grant funding and 50 publications focusing on interventions to facilitate team effectiveness, employee health and well-being and conventional and internet-based research methods. He served as Editor-in-Chief of the two-volume *Encyclopedia of Industrial and Organizational Psychology* (2006) and the *Handbook of Research Methods in Industrial and Organizational Psychology* (2002, 2004). He teaches research ethics and methods and has been honored for his teaching and mentoring.

Graduate students will be deeply involved in EAREE, both as project assistants to the ethicists on each campus as well as participants in the annual meetings, students in OpenSeminar, and subjects of research in the evaluation component. The evaluation component will be described below.

Partnering organizations

EAREE is a coalition of the seven doctoral-granting UNC universities plus the Office for Research of the UNC General Administration. We here describe why each organization is involved. Letters of support (in Supplementary Documentation) are provided by Deans of the Graduate Schools and by Dr. Russ Lea, Vice President for Research, UNC--General Administration.

The campuses at which the students matriculate differ widely in the extent of their graduate programs, their selectivity, their racial and ethnic composition, and cost of tuition. By drawing students from such diverse campuses, EAREE will be able to assess its effectiveness for use in a wide range of graduate programs.

To achieve EAREE's objectives, it is essential to have the key people and institutions involved. Now we explain why the University of North Carolina system was chosen.

The University of North Carolina is widely acknowledged as not only the *oldest*, but one of the very *best* public university systems in the country. UNC builds its strength from its diversity; each of its 16 public constituent campuses is unique, and differs in mission, size, geography, constituencies, and service. UNC campuses collectively offer more than 200 degree programs and graduate more than 30,000 students each year.

UNC received over \$1 billion in external funds in 2005 and reported more than \$672 million in federally supported expenditures that same year. The Universities' sponsored programs provide important benefits to the state, nation, and world. Examples include: new industries and jobs; improved health care and medical therapies; environmental protection; entrepreneurial ventures for new technologies; cultural enrichment and a deeper understanding of our diverse, multi-faceted world and improved strategies for addressing social concerns.

Last year, UNC personnel won more than 7,380 competitive sponsored awards valued at over \$1 billion. Many of these support programs involving collaboration among other universities or investigators, both national and international. A growing number focus on economic development, technology transfer, faculty development, and K-12/university partnerships (UNC-GA website, 2007).

As one of the nation's most active and diverse systems of public research universities, the seven doctoral-degree granting universities in the UNC system provide an unparalleled testing ground for the national demonstration project found in EAREE.

Following are the benefits of having NCA&T lead the project.

North Carolina A&T State University. There is not a more fitting lead institution than NC A&T for this project. NC A&T awards more doctorates each year to African-Americans than any other institution in the world. As mentioned, it is currently working in partnership with NC State University to develop the OpenSeminar course and Research Ethics Education paradigm. As one of the eight LANGURE Universities, NC A&T has reached several milestones in research ethics education:

- A standing interdisciplinary committee of LANGURE senior research ethics fellows with representations in Engineering and science divisions
- Each fellow attended a workshop to develop a module in the respective disciplines
- Directors of Graduate programs in collaboration with the graduate school have endorsed the plan to develop an interdisciplinary research ethics course following a need presentation session
- Principal Investigator developed and taught a research ethics course to doctoral students in Energy and Environmental Engineering program (EES 700: Research Ethics)
- Recently identified course numbers 998 and 778 in collaboration with the graduate school for across the board doctoral and masters courses in research ethics education
- Interim Chancellor, Dr. L.V. Hackley holds ethics education workshops across the campus to reach various university groups including staff, faculty, administrators, and students at all levels

Two recent developments deserve special mention:

- The Vice Chancellor for Research has agreed to support research ethics education and will provide a research assistant to Dr. Archibong.
- Discussions are underway at NC A&T about creating a Research Ethics Education Center under the Division of Research and Economic Development in collaboration with the School of Graduate programs.

NC A&T is a high research activity LGU and HBCU known for assisting researchers to integrate discussions of ethics into the graduate curricula. The University is in the process of approving a two-level interdisciplinary graduate research ethics course in both engineering and science. In addition to the large number of minority representation in the University, NCA&T hosts a large number of international graduate students.

Project Management Plan

Dr. Archibong assumes ultimate responsibility for the success of all phases of EAREE. She will be assisted by three graduate student Junior Ethics Fellows (one funded by NC A&T and two funded by this project). The students will work as research assistants and help coordinate the overall project and efforts at NC A&T.

Each of the Senior (faculty) Ethics Fellows on each campus will have a Junior (graduate student) Ethics Fellow as an assistant.

Table 3 shows the plan of work. In the fall term of year one, the Senior and Junior Fellows will gather in Greensboro at NC A&T for a two-day workshop. The goals of the workshop are for the participants to: (1) Learn to teach the OpenSeminar in Research Ethics, (2) Discuss pedagogical techniques for using the modules successfully in conjunction with the core course, and (3) Complete plans for working with Graduate Deans and Directors of Graduate Programs to institutionalize support for research ethics education. The Junior Research Ethics Fellows at NC A&T will provide clerical and logistical support for workshop planning, execution, and evaluation. Therefore, no additional funds are requested for help in managing the workshops.

In the spring term of year one, the course will be taught on each campus. In year two, the workshop will be held again in the fall and the course will be taught in the spring. In year three, each institution will review the course. If the Senior Ethics Fellows, Graduate Deans, and Graduate Directors elect to continue the course, the campus will fund the Junior Ethics Fellow and provide the resources needed to offer the course. A final workshop in spring of year three will evaluate the project.

Dissemination

Our dissemination plan capitalizes on the OpenSeminar in Research Ethics online web resource created by the LANGURE team. The course, its burgeoning virtual community and its modules are freely available online to all that interested. However, it is important to secure faculty, administrative and student “buy-in” for OpenSeminar. It is also vital that faculty be trained to use the website and its materials. The PIs, consultant, and evaluations expert will work with the Sr. and Jr. Ethics Fellows on each campus to secure administrative and student buy-in and faculty know-how. They will publish the results of EAREE and to present it at professional meetings. A report on the project and findings of the evaluation will be published in a leading journal. We will publish material in refereed journals as appropriate and present it widely at professional meetings. Our team has had a preliminary conversation about publishing the results of our assessment work with Joan Seiber, editor of *Journal of Empirical Research on Human Research Ethics*. We have also had preliminary conversations with Stephanie Bird, editor of *Science and Engineering Ethics*, about publishing findings about the success of the OpenSeminar at the EAREE campuses. Finally, we have an email message dated 4/10/07 provisionally offering a book contract from Fritz Schmuhl, Bioethics Editor of Springer Publishing, Dordrecht, to publish the entire contents of OpenSeminar.

In preparing this proposal the EAREE team worked to design an effective, broad, and long-term management and dissemination plans. As mentioned, sections of the course have already been translated into four languages. With the team of ethicists across the state and the support of the Graduate Deans, we expect to enroll as many as 200 doctoral students over the 3 years of the grant. All EAREE materials will be put online by the research assistant at NC A&T who will also serve as OpenSeminar Managing Editor.

Program Evaluation Plan

EAREE will employ extensive and multiple assessment mechanisms with iterative feedback loops providing opportunities to learn of our successes and failures. These mechanisms will make it possible to continuously adjust our course. To oversee these mechanisms, we have partnered with a widely-respected expert in evaluation methods, Dr. David Musick of ECU. Dr. Musick is a leader in evaluation of educational interventions. For EAREE, Musick will employ carefully designed tools to assess the extent to which the project achieves its goals. As part of his work, he will twice survey two groups of doctoral students: a control group not enrolled in OpenSeminar, and an experimental group, enrolled in OpenSeminar. He will evaluate both groups of students just before the OpenSeminar is taught and just after it is taught.

Musick will also evaluate both groups in Year 3. This longer-term follow-up is important to discover how students perceive their LANGURE training from the vantage point of having been in their careers for several years. Musick will ask questions such as: Was the OpenSeminar useful? Were the modules relevant? Stimulating? Was anything missing from their RE education? The results of this survey will help us understand what we could or should have done differently, and what steps would improve future such efforts.

Using a variety of qualitative and quantitative means, Musick will assess the success of each project initiative in achieving its objective. In consultation with other faculty participants, themselves expert in the creation, use, and interpretation of evaluation instruments, Musick will devise assessment mechanisms using self-assessment, summative and formative methods. The tools and the results will be available on the EAREE

website. Musick will build his instruments to be consistent with the pre- and post-test instruments used in LANGURE to evaluate the students' progress in the course. We will seek both faculty and student responses to the course, instruction, and modules and we will gather statistics of department and student participation.

Evaluation in an educational setting by necessity implies a judgment of merit or worth (Coles & Grant, 1985). It is vital to establish at the outset the specific criteria of effectiveness to be used, so that judgments regarding overall program effectiveness and outcomes can be made in an objective manner (Isaac & Michael, 1995).

A pre-test and post-test was administered to 78 graduate students in a half dozen sections of PHI 816: "Introduction to Research Ethics," taught by Comstock at NC State over the last 3 years. The average scores on these tests provide a working hypothesis for EAREE course evaluations. On the 25 multiple choice question pre-test, we expect students to score 63 / 100. On the post-test, we will expect a score of 98 / 100. Our working evaluative hypothesis therefore is this: We expect doctoral candidates enrolling in the OpenSeminar to score in the 70% range on the pre-test. We also expect doctoral candidates not enrolling in the OpenSeminar to score in the 70% range on the pre-test. We expect those students who have finished OpenSeminar to score in the 95% range on the post-test. We expect those students not enrolled to score between 70% and 95% on the post-test. Knowing the considerable limitations of this pre- and post-test method we will supplement this method with other evaluation instruments, including voluntary participation in the University of Oklahoma project.

By employing early, mid-course, and late-term assessments, the EAREE team will be able to show where EAREE succeeded and if it fell short. It will be able to determine the extent to which it properly identified the issues students encounter in their chosen professions. And it will have detailed feedback on the extent to which students internalized the principles and critical thinking tools supplied them.

The design of specific data collection and analysis procedures that provide information about the following components of the project: learner satisfaction with the OpenSeminar modules (individual modules as well as the overall program); learner feedback on the performance of faculty who teach the courses described in the proposal; faculty satisfaction with their teaching efforts described in the proposal (self-evaluation); and feedback from participants in faculty development workshops (Fall, years 1-3). Surveys of student control and participant groups will include: pre- and post-testing using existing LANGURE instrument; University of Oklahoma survey concerning attitudes toward research ethics; and longitudinal survey concerning moral development (Defining Issues Test) (Rest, 1979; Hren et al., 2006).

Educational program evaluation in an outcomes-oriented model asks the question "Is the overall program accomplishing its objectives?" As indicated in the evaluation plan, the variety of evaluation data collected will be used as an integral part of performance improvement by the PI. Using a systematic problem solving approach, opportunities for improvement will be identified and a plan of intervention will be implemented. This intervention plan will identify what action is to be taken, when, and by whom. The impact of the intervention plan will be formally reviewed by the PI on a quarterly basis. Dr. Music will oversee all aspects of the assessment activities and report outcomes on a regular basis to the PI and funding agency as required.

Results of prior NSF support

EAREE builds on the successes of three prior NSF efforts: (1) the National Bioethics Institutes, (2) the Research Ethics Infrastructure for Graduate Education; and (3) the Model Curriculum for Land Grant Universities in Research Ethics (LANGURE).

The first effort, the Bioethics Institutes, were the result of four NSF awards to EAREE's consultant, Gary Comstock (PI or consultant): "Model Bioethics Institute" (#9254504, 94-98), 2 BIs (at Illinois and Michigan State, \$125,666); "Purdue Bioethics Institute" (#9601759, 97-99) 3 BIs (at Purdue, ~\$100,000); "National

Bioethics Institute” (#9729323, 99-00); 2 BIs (at Iowa State and Oregon State, \$106,445); and “FLAD/NSF International Bioethics Institute” (#9906244, 00-02), 3 BIs (at University of Lisbon, ~\$100,000).

Between 1994 and 2000, NSF’s Ethics and Values Studies (EVS) Program sponsored the Institutes in the US. In 2000, EVS launched an international version of the Institutes directed by Comstock, held each summer through 2002. Joining with the European Union and the University of Lisbon, EVS funded 6 US life scientists each summer to join European life scientists to discuss bioethics. Funding is secure for this international initiative through 2007. One mark of a highly successful program is its ability to attract independent funds after a grant has ended. Independently of the NSF awards, Comstock worked with a team to secure grants from USDA and the National Agricultural Biotechnology Council for three BIs at NC State, 99-01; and for four BIs at Iowa State, Minnesota, Wisconsin, and South Dakota State (02-05). These Institutes continue through the coming summer (05). The PI has the ability to leverage NSF funds by attracting new funds to continue projects beyond their initial launch period.

More than 20 publications resulted from these awards, including a book edited by Comstock, *Life Science Ethics* (Ames: Iowa State Press, 2002). In December 2001, Noland and AMS, an independent firm, surveyed the 503 past Institute participants to ascertain the institutes’ level of effectiveness. The study concluded that 98% of the participants felt that the Institute achieved its goal of introducing them to ethical theory and pedagogy, and helping them to begin to introduce ethics into their own courses.

The second NSF-sponsored award, “A Research Ethics Infrastructure for Graduate Education” to NC State University (#9818359, 1999-2001, \$236,269) sponsored two intensive research ethics institutes attended by 44 faculty, and two comprehensive, three-credit-hour ethics seminars for 24 graduate students. Ten instructional modules, previously mentioned in section 2, were developed.

The third effort has previously been discussed: LANGURE, awarded to Comstock, Alston-Mills, and Grant, co-PIs, at North Carolina State University (#0530217, 2005-08, \$249,393. LANGURE involves a network of seven other universities: Hawaii, Iowa State, North Carolina A&T, NC Central, UNC-Fayetteville State, Purdue, and Wisconsin. Senior faculty and graduate students at these institutions developed the one-credit course, “OpenSeminar in Research Ethics.” LANGURE developed a novel suite of 15 interactive, online research-ethics modules, enlisting the assistance of 14 graduate students—LANGURE Junior Research Ethics Fellows. By developing strategic alliances in science, engineering, and social-sciences education across the U.S., LANGURE has created an online course that addresses all four the problem areas in RCR. It is enhancing research programs at three HBCUs, improving efforts to recruit minority students into science and engineering graduate study, and broadening ethics education nationally by providing free online access to the course and modules.

Conclusion

The **intellectual merit** of the proposal is that EAREE is the first initiative to extend research ethics education for doctoral candidates in all of the fields in which NSF sponsors research to all of the doctoral-degree granting campuses in a state system and evaluate them using control and experimental cohorts. It will systematically guide and **stimulate creative thought** about issues in research in a technologically driven society. It will **encourage high ethical standards** in students who, as professionals, will work in a globally inter-connected world where cultural differences and expectations can raise daunting dilemmas. By moving LANGURE’s vision for REE to the next step, EAREE will dramatically improve the institutionalization of research ethics education, extending a novel curriculum across an entire state network and carefully assessing its effectiveness with engineering and science doctoral candidates.

The **broader impacts** of the proposal are that by **establishing a state-wide collaboration teaching a standardized novel curriculum in research ethics**, and by developing alliances in science, engineering, and

social sciences education across the NC state system, EAREE will create an inter-institutional template other state systems may adopt for their system-wide research ethics education efforts. It will enhance the research programs at three HBCUs, improve efforts to recruit minority students into science and engineering graduate study, and broaden ethics education nationally by providing free online access to the course and modules. EAREE will model and capitalize upon the efficiencies and synergies created when institutions collaborate. disseminate across the UNC system the use of the online common course, and serve as a **model of the efficiencies and synergies created when institutions within a state collaborate.**

Serve a national audience: Many states boast systems of public research institutions. They enroll thousands of new graduate students in doctoral programs each year. These systems may all benefit from the demonstration project found in EAREE.

Benefit women and underrepresented minority students: EAREE will provide discussion of research ethics topics key to recruiting minority students into STEM disciplines within and outside of North Carolina.

Enhance research climate at HBCUs: Seventeen faculty members from North Carolina's HBCUs helped to plan LANGURE and are fully apprised of the new effort in EAREE. EAREE will draw on these faculty to strengthen the research programs at all of the EAREE campuses, including NCA&T. By enhancing the mentoring of minority students and establishing closer ties between UNC's system of institutions, EAREE will help to remove barriers to underrepresented students pursuing Ph.D.s in science or engineering.

Given the research strength of the UNC research system, its leadership role in research ethics education, the established network of LANGURE engineers, scientists and ethicists across the UNC system; the commitment of each of the EAREE campuses to this project, and the PIs' accomplished history of completed NSF projects; the prospects for EAREE's success are extremely high.