Communicating science, technology, and risk

An executive summary of a proposal for a Ph.D. program in the Greenlee School of Journalism and Communication

Iowa State University
of Science and Technology

Unit involved:
Greenlee School of Journalism and Communication, ISU

CIP Discipline Specialty Title:
Communication, journalism and related programs

CIP Discipline Specialty Number (six digits):
09.9999 Communication, journalism and related programs, other

Level:

B	M
D	FP

Title of Proposed Program:
A doctoral program in the communication of science, technology, and risk

Degree Abbreviation:
Ph.D.

Approximate date to establish degree:
August 2010

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■ PROGRAM DESCRIPTION

The proposed doctoral program answers the need to enhance the science, technology, and risk communication dimension of the land-grant mission of Iowa State University. The School has focused on science and agricultural communication since it was founded more than a century ago. This doctoral program aims to develop a cadre of (1) researchers who will examine the communication-related aspects of science- and technology-based risk debates, (2) educators who will prepare students not only to communicate effectively scientific and technological risks through the mass media, but to analyze their cultural effects, and (3) communication practitioners who will conceptualize and implement strategies that foster vibrant dialogues about science and technology risk issues among identified audience segments and platforms.

■ PROGRAM OBJECTIVES

From terrorism to avian flu, from genetic engineering to the growing of a bioeconomy, science and technology issues continue to shape modern life. Risks—whether real or imagined—also accompany the benefits people enjoy from scientific and technological breakthroughs. The Greenlee School doctoral program will be first in the nation to lay claim to a specific intellectual ground: the communication of science, technology, and risk.

Science and technology communication addresses theoretical and pragmatic questions central to issues related to food safety and security, new and emerging diseases and pests, agricultural and environmental sustainability, and poverty alleviation, among others. It explores three broad but interrelated topics: (1) communication between scientists and journalists or other media practitioners, (2) communication of scientific and technical information to the public, and (3) science and technology communications policy. Risk communication analyzes how the public understands risk, how policy makers respond to risk, and how both of these understandings can be compared with risk assessment. In risk communication, risk is defined broadly to include scientifically assessed or perceived risks related to weather-related events, food-borne pathogens, genetically modified crops/foods and pharmaceuticals, nuclear power and other energy issues. It also includes politically-oriented risks such as those associated with bioterrorism.

■ PROGRAM OUTCOMES

The general objective of this program is to prepare individuals to become leading researchers, educators, and communication strategists and practitioners in the field of science, technology, and risk communication. Upon completion of the program, students will be able to:

1. Conceptualize, design and complete independent and advanced research on significant issues in science, technology, and risk communication;

2. Develop professional competence in university-level teaching based on an articulated philosophy of education;

3. Develop knowledge and skills to plan, implement and evaluate science, technology, and risk communication programs.

The Ph.D. program in the communicaiton of science, technology, and risk is projected to train a new cadre of communication researchers able to take charge of the research imperatives relating to the communication of science, technology, and risk to identified segments of the public and to the public at large. Within this area, the program is expected to set in motion a research agenda that aims to:

1. Illuminate how scientific discovery is communicated between and among researchers and those who apply and use the results of research;

2. Ascertain public understanding and knowledge of science, scientific procedures, scientific findings, and how to cultivate a public informed enough to make intelligent and respectful choices about issues with critical scientific and ethical underpinnings;

3. Ascertain the development and change of public attitudes toward science, technology, and risk issues, and the role of such attitudes in the adoption of and resistance to science-based products and innovations;

4. Determine how information about science and technology is communicated and how it influences public debate on the conduct of science, the implementation of science and technology policy and education programs;

5. Explore the role of advertising, public relations, and other persuasive communication techniques in expanding public dialogue about science, technology, and risk issues;

6. Explore the observed and desired role of the educational system, communication practitioners, the media, private firms, and advocacy groups in scientific communication and understanding.

The main thrust of research efforts will be to conduct basic and applied studies on communication's contribution to the public understanding of science, technology, and risk. Some examples:

1. Values and cognitive structures that have a bearing on public understanding and acceptance of the products of science and technology;

2. Exploration of "controversial" and "benign" scientific and technological topics from the dual perspectives of scientific uncertainty and mass media coverage;

3. The social responsibilities of and interactions among scientists, journalists, advocacy groups, policy makers and the public;

4. Communication strategies to support programs aimed at eliminating and reducing the vulnerability of food systems to bio-security failures. Expertise in mass communication must complement life science and technology programs by monitoring and evaluating public awareness and implementation of safe food handling practices, providing rapid access to food safety information, developing effective outreach programs, and formulating communication protocols to help sustain public confidence in the food safety system;

5. Public perception of genetic engineering and biotechnology, environmental health issues, and other scientific and technological topics that might be perceived as risky;

6. The transfer of science-based knowledge and technology across cultures and societies;

7. Implications of new media technologies, governmental regulation and private sector roles in shaping public policy and public perceptions of science, technology, and risk issues.

This doctoral program is expected to produce a cadre of communication specialists able to educate students on the foundations of science, technology, and risk perceptions; conduct hands-on skills training; and inform students of underlying cognitive processes, the values and concerns brought by various audiences, and the likely responses of these audiences to science, technology, and risk issues. Within the science, technology, and risk communication domain,

these include:

1. The use of persuasive advertising and public relations techniques— traditionally used to sell products and build images— to improve and protect people's health and to hone public education messages;

2. Reporting and writing about science and technology subjects to general audiences through the print, broadcast and online media;

3. Developing strategies to enhance trust and minimize conflict over science, technology, and risk issues;

4. Understanding the legal controls of information, copyright and property rights, conflicting perspectives among component groups, ethical standards, responsibility, and the public good; and

5. Working more effectively with the media.

The doctoral program is expected to train communication strategists and practitioners able to apply science, technology, and risk communication principles to develop and implement communication programs and risk management policy. This breed of practitioners will have to the ability to, among others:

1. Craft organizational policies and messages responsive to audience risk concerns;

2. Design and execute communication strategies and campaigns for risk or crisis communication;

3. Understand and close the gap between lay people and experts, and help people make more informed choices.

In its report on the status and future of doctoral education in journalism and mass communication, a task force of leading scholars in the discipline called for the exploration of "new ways of cultivating the notion of civic engagement in doctoral programs with the goals of enhancing social, political, economic (and external perception) of journalism and mass communication research" (AEJMC Task Force Report on the Status and Future of Doctoral Education in Journalism and Mass Communication, 2006, p. 58). Considering that the above objectives were drawn in recognition of state and national needs, this proposal answers this call.

■ PROGRAM OF STUDY

The proposed Ph.D. program in the communication of science, technology, and risk is a *research,* not a writing, degree. Doctoral study provides students with the opportunity to learn the discipline's theoretical underpinnings, and standards of evidence and methods.

The proposed program focuses on the communication of science, technology, and risk and not on the policy aspects inherent in the field of risk analysis, the subject of the interdisciplinary Risk Analysis and Decision-Making graduate minor now under development. It is also different from a general mass communication Ph.D. program in that the theoretical exposure encompasses all social science theories pertinent to science, technology, and risk, not just the theoretical frameworks within the communication disciplines.

This program will be offered in cooperation with other departments and units on campus, such as Rhetoric and Professional Communication, Food Science and Human Nutrition, Rural Sociology, the Biosafety Institute for Genetically Modified Agricultural Products, the Bioeconomy Insitute, and Sustainable Agriculture. The intention is to encourage students in science, technology, and risk communication to choose outside classes that match their specific topical area or area of specialization.

This doctoral program provides future academics and professionals with rigorous training in theory and research. Students seeking the Ph.D. must successfully complete at least 72 graduate credits of course work and research, including credits earned in a master's program. No fewer than 36 of these 72 graduate credits must be completed at ISU. After examining doctoral programs at peer institutions, the Greenlee School Graduate Steering Committee found it is possible to complete all degree requirements in 36 months (three years) after the master's degree with a teaching assistant commitment of one course per semester. Doctoral students will have enough time to take a full load each semester, complete their course work within the first two years, and write a disserta-

tion during the third year. Similar time frames exist for Ph.D. programs in other research-intensive universities such as the University of Florida, Cornell University and Syracuse University.

The student develops an area of concentration in a scientific and/or technological domain (i.e., biotechnology, biorenewable energy, food safety, natural resources management, sustainable agriculture) by taking appropriate courses in these disciplines. For example, a student who plans to concentrate on the communication aspects related to foreign animal and zoonotic diseases should take appropriate courses in the College of Veterinary Medicine. Other areas may emerge in the future as new risk factors come into play. By requiring students to take courses in the conceptual fields in which they intend to work, they will obtain a more in-depth theoretical understanding of their research areas. To ensure that a student has taken appropriate courses in an area of concentration, the student's comprehensive examination committee must include at least one faculty member from that program or discipline.

■ POTENTIAL STUDENTS

We expect to attract to the program students who may belong under any three of the following categories:

1. Students with master's degrees in journalism and mass communication;

2. Students with master's degrees in fields other than journalism

The following minimum numbers of credit in the indicated areas are required to complete the PhD:

- 9 credits of communication theory and strategy courses
- 6 credits of science, technology and risk communication theory and conceptual courses
- 6 credits of risk analysis, science and technology policy courses
- 6 credits of courses related to legal and ethical issues
- 15 credits of research methods and statistics courses
- 12 credits of courses related to the student's (technical) subject matter area of concentration
- 3 credits of graduate seminar
- 6 credits of Jl MC electives
- 9 credits of dissertation research

The following section lists the courses under each identified area

MASS COMMUNICATION THEORY AND STRATEGY:
9 credits
Jl MC 501 Theories of mass communication (Required)
Jl MC 601 Advanced theories of mass communication (Required)
Jl MC 510 Strategies of mass communication
Jl MC 574 Communication technology and social change

SCIENCE, TECHNOLOGY, AND RISK COMMUNICATION:
6 credits
Jl MC 547 Science communication
Jl MC 560 Risk communication and perception (Required)
English 621 Rhetoric of science

RISK ANALYSIS, SCIENCE AND TECHNOLOGY POLICY:
6 credits
Agron/Tox/VDPAM 570 Risk assessment for food, agriculture and veterinary medicine
Agron/Econ/VDPAM 566X Science policy and food

RESEARCH METHODS AND STATISTICS:
15 credits
STAT 401 Statistical methods for research (or equivalent) (Required)
Jl MC 502 Communication research methods (or equivalent) (Required)
Jl MC 602 Advanced communication research methods (A. Survey research; B. Experimental design; C. Content analysis; D. Qualitative methods)

and mass communication;

3. Students with bachelor's degrees (in communication or other fields). This track is intended for outstanding students who can be admitted directly from a bachelor's program. These students would pursue a five-year program of study leading to the Ph.D. without the master's degree. Students in this category who perform poorly on prelims will be given an opportunity to earn a terminal master's degree.

■ PERSONNEL, FACILITIES, AND EQUIPMENT

Faculty. In terms of faculty strength, the School is now primed and well positioned to offer the doctoral degree. From 2003 to Fall 2008, 10 assistant professors were hired, including one with a joint appointment in Human-Computer Interaction. An additional two assistant professors have been approved for hiring during the 2008-2009 academic year. All of these hires have expertise in the application of their field's theoretical and conceptual frameworks in the communication of science, technology, and risk. This will bring the School's total graduate faculty contingent to 21 by AY 2009-2010.

Effects of new courses on the work load of present staff. The School is in the process of streamlining its curriculum for the two undergraduate majors it offers. This streamlining operationally involves an intensive review of the syllabi of existing

STAT 402 Statistical design and analysis of experiments
STAT 404 Regression for social and behavioral research

LEGAL AND ETHICAL CONSIDERATIONS: 6 credits
Phil 537X Bioethics and public policy
PolS 580 Ethics and public policy
PolS 586 Science, technology, and public policy
Jl MC 598H. Graduate seminar: Law and ethics in communicating science, technology, and risk

SCIENTIFIC/TECHNICAL SUBJECT MATTER SPECIALIZATION: 12 credits
Note: This is a preliminary list as suggested by discipline representatives. Courses for other areas of specialization (e.g., engineering, sustainable agriculture) are being identified.

Area of concentration: ***Biotechnology***
GDCB/Gen 508. Biotechnology in agriculture, food, and human health (Prereq: Biol 211 and 212, Principles of biology, or equivalent)
Gen 411. Molecular genetics
Gen 520. Genetic engineering (Prereq: 411 or B B 405)
C E 326. Principles of environmental engineering (Prereq: Chem 167 or 178 or enrollment in E M 378)

Area of concentration: ***Food safety and food security***
FS HN 403. Food laws, regulations, and the regulatory process (Prereq: 3 credits in food science and technology coursework at 200 level or above)
FS HN 412. FS HN 412. Food product development (Prereq: 311 or 411)
FS HN 566. Nutrition counseling and education methods (Prereq: Graduate student status)

Area of concentration: ***Natural resource ecology and management***
NREM 460 Controversies in renewable resource management (Prereq: 120 and A Ecl 312 or NREM 301, and junior classification)
NREM 571. Agroforestry systems: Local and global perspectives (Prereq: 6 credits in biological science at 300 level or above)
NREM 532. Human dimensions of natural resource management (Prereq: A Ecl 312 or equivalent plus 6 credits of biological sciences; instructor's permission)

courses to reflect the theoretical foundations and the professional practices of the converging media, the elimination of redundant courses, and the building of flexibility to keep pace with industry demands for specialized expertise. This streamlining process aims to free at least two FTEs to teach in the graduate program.

The School director has initiated steps to balance the number of graduate research assistants (now made up exclusively of master's students) with more teaching assistants to reduce general faculty teaching assignments from 3-2 to 2-2.

The doctoral program is expected to attract teaching and research assistants on a sustained basis. The continuous supply of trained graduate assistants will encourage new initiatives in undergraduate teaching and learning, and boost the quality of research and other scholarly projects even at the undergraduate level.

The program also proposes only two new course offerings at the outset, in addition to modifications to already existing courses.

Research facilities. The School has facilities and equipment in sufficient quantity and quality to carry out the educational objectives of the proposed doctoral program. Major and significant changes in equipment and facilities have taken place over the past five years. For one, Hamilton Hall has undergone a $2 million renovation. Part of this renovation included the creation of a Graduate Hub, constructed

Area of concentration: ***Sociology***
Soc 541. Technological innovation, social change and development (Prereq: 6 credits in the social sciences)
Soc 544. Sociology of food and agricultural systems (Prereq: 6 credits in sociology)
Soc 547. Sociology of adoption and diffusion (Prereq: 6 credits in sociology)
Soc 640. Comparative social change (Prereq: 6 graduate credits in sociology)

Area of concentration: ***Bioeconomy***
BRT 501 Fundamentals of biorenewable resources Prereq: Undergraduate training in an engineering, physical or biological discipline or degrees in agriculture or economics)
SUSAG 509. Agroecosystem analysis (Prereq: 6 credits in social sciences, 6 credits in natural, biological or engineering sciences and senior or above classification)
SusAg 610. Society and technology in sustainable food systems (Prereq: Graduate classification)
BRT 590. Special topics in biorenewable resources (Prereq: Permission of instructor)

Area of concentration: ***Global climate change***
Agron/EnSci/Mteor 404. Global change (Prereq: Four courses in physical or biological sciences or engineering; junior standing)
Agron/EnSci/Mteor 406 World climates (Prereq: Agron/Mteor 206)
EnSci/ Ia LL/L A 461I. Introduction to GIS
EnSci/NREN 507. Watershed Management (Prereq: A course in general biology)

PRELIMINARY ORAL EXAMINATION

DISSERTATION: 9 credits
Jl MC 699 Doctoral dissertation (9 credits)

FINAL ORAL EXAMINATION

in Room 04 Hamilton Hall, equipped with computer work stations with word processing, spreadsheet analysis, data presentation, graphic design, data storage and retrieval, and statistical analysis capabilities. The Grad Hub has printing facilities exclusive for graduate students' use.

The Graduate Hub is also the School's focal research area. Today, it has (1) two focus group rooms, one that seats ten and another that can accommodate smaller group sizes (about four to six participants); (2) a physiometric testing laboratory with the ability to measure brain wave reactions, heart rate, and galvanic skin responses to communication stimuli; (3) two private offices for grant development, writing and administration; (4) a survey research space; and (5) a reception area.

■ PROJECTED ENROLLMENT

The numbers of students projected to be enrolled in this program during the first seven years are estimated below. These figures were based on the interests demonstrated by current master's students in journalism and mass communication, as well as doctoral students from the physical and biological sciences with the desire to hone their communication capability. These conservative estimates were also based on doctoral enrollment levels in existing Ph.D.-granting institutions nationwide.

■ APPROVALS BY COMMITTEES AND AUTHORITIES

This official application for a doctoral program was unanimously approved by the Greenlee School faculty in a special session on February 17, 2006, and by the Greenlee School Advisory Council on April 12, 2006. Letters of endorsement by the School's director and the director of BIGMAP, a partner program, accompany this proposal.

This proposal was approved by the LAS Curriculum Committee in Spring 2008, by the LAS Faculty Representative Assembly in Fall 2008, and by the Graduate College Curriculum Committee in Fall 2008.

■ RELATIONSHIP WITH OTHER PROGRAMS AND INSTITUTIONS IN IOWA

Among the Iowa Regents universities, the University of Northern Iowa does not have a graduate program in any field of communication. The University of Iowa offers a general doctoral program in mass communication. Iowa State University has a doctoral program in rhetoric and professional communication.

Rhetoric and professional communication, Department of English, ISU. The Ph.D. in rhetoric and professional communication focuses on "the theory and practice of rhetoric and written communication in professional communities such as worksites, disciplines such as science, and social groups" (ISU Department of English website, 2007). To fulfill the degree requirements for the RPC doctorate, students "take courses in rhetorical theory, writing and analyzing professional documents, the history of rhetoric, research methodologies, and pedagogy. The degree qualifies graduates for academic positions in rhetoric and in business and technical communication as well as for work in the private sector as professional writing specialists, editors, and communications production managers" (ISU Department of English, 2007). While the RPC program does include risk communication as a component, the Greenlee School doctoral proposal sees science, technology, and risk communication as the pivotal thrust of its proposed doctoral program.

Under the current National Research Council (NRC) taxonomy, the RPC program falls under the broad category of "Arts and Humanities," under the field "English Language and Literature," and the subfield "Rhetoric, Com-

Graduate	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Those with master's degrees	3	6	9	6	9	12	12
Those without master's degrees	1	2	3	4	5	5	5

position, and Technical Writing." Using the NRC taxonomy, our proposed program falls under the broad category of "Social and Behavioral Sciences" under the "Communication" field.

The mass communication doctoral program, School of Journalism and Mass Communication, University of Iowa. The University of Iowa's program is one that can be considered a "generic" doctoral program. It has "a long-standing tradition of qualitative inquiry in which students explore historical, legal, new media, and international aspects of media communication from cultural and critical perspectives" (UI School of Journalism and Mass Communication, 2005). This emphasis is evidenced by the dissertation and research output of its students and faculty, an overwhelming proportion of which deals with critical-cultural studies. Iowa State's proposed program will be more quantitative. Iowa and Iowa State's programs may intersect, however, in the area of health communication, which has been identified by the Graduate Steering Committees of both Schools as a potential area of research and teaching collaboration. The University of Iwa's journalism and mass communication faculty, meeting last fall, found the proposal to be distinct from their own, and will attract a different group of students. It found no overlap in the two programs and has indicated support for the ISU proposal (see letter included as part of the full proposal).

Reinhold Bubser, UNI dean of Liberal Arts and Sciences, in consultation with interim provost James Lubker and department head of communication studies John Fritch, has written a letter posing no objections and raising no concerns to any part of the program proposal. UNI has also expressed its support of the proposed ISU program (a letter of support and endorsement from UNI is also included in the full proposal).

■ WORKFORCE NEED AND DEMAND

The current demand for specialists in science, technology, and risk communication with doctoral training far outstrips the supply. Based on specialized employment opportunity websites and databases (i.e., the job boards of the premiere scholarly and professional organizations in the communication field, USAJobs, and Communication Initiatives), these opportunities can be categorized into four major areas: academic, government (federal, state, local), international and non-governmental, and private.

The following table lists a frequency count of these employment opportunities over the last two years. ■

Job category	Examples of positions available	Count
Academic	Assistant, associate, full professors; post-doctoral fellows; science and technology communication chair holders, heads of communication research centers, professional/scientific staff members with science, technology, and risk communication responsibilities	2006: 18 2007: 40
Government (federal, state, local)	Chief information officers, science and technology communication advisors, strategic communication managers, risk communication coordinators, communication and training supervisors and specialists, public affairs directors, supervisors and specialists, research analysts	18
International and non-governmental	Regional reporting and information officers, strategic communication directors, coordinators and specialists, policy advisers, media liaison specialists, senior science and technology writers/editors	10
Private	Senior communication analysts, researchers, scientific communication managers, communication specialists, account directors, senior science and technology communication managers, senior science and technology editors/writers	8