Graduate Ethics Curricula for Future Geospatial Technology Professionals

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GIS Profession: A Nascent Field

- U.S. Department of Labor highlights “geographic/geospatial technology” as key high-growth field for 21st century
- $3.3 billion global market (Daratech, 2006)
- Ethical issues loom large in public perception of the field
  - Surveillance and privacy
  - Social inequalities
  - Intellectual property rights
  - Citizen science, local activism
Mapping the 7 Deadly Sins

GREED, Envy, Wrath, Sloth, Gluttony, Lust, Pride

Average income vs. below poverty line

Kansas State University Geography & Wired, 2009
The Rise of Professional Ethics Education

- Need to prepare GIS professionals for these challenges
- UCGIS GIS&T* Body of Knowledge includes units on ethics among its 329 definitive topics
  *University Consortium for Geographic Information Science, Geographic Information Science & Technology
- Recommended component at undergraduate, graduate, and professional levels
- Needed as part of professional certification process (e.g., GIS Certification Institute)
Codes of Ethics, Rules of Conduct

CODE OF ETHICS

The GIS Certification Institute

This Code of Ethics is intended to provide guidelines for GIS (geographic information system) professionals. It should help professionals make appropriate and ethical choices. It should provide a basis for evaluating their work from an ethical point of view. By heeding this code, GIS professionals will help to preserve and enhance public trust in the discipline.

This code is based on the ethical principle of always treating others with respect and never merely as means to an end; i.e., deontology. It requires us to consider the impact of our actions on other persons and to modify our actions to reflect the respect and concern we have for them. It emphasizes our obligations to other persons, to our colleagues and the profession, to our employers, and to society as a whole. These obligations provide the organizing structure for these guidelines.

The text of this code draws on the work of many professional societies. It is not surprising that many codes of ethics have a similar structure and provide similar guidelines to their professionals, because they are based upon a similar concept of morality. A few of the guidelines that are unique to the GIS profession include the encouragement to make data and findings widely available, to document data and products, to be actively involved in data retention and security, to show respect for copyright and other intellectual property rights, and to display concern for the sensitive data about individuals discovered through geospatial or database manipulations. Longer statements expand on or provide examples for the GIS profession.

A positive tone is taken throughout the text of this code. GIS professionals commit themselves to ethical behavior rather than merely seeking to avoid specific acts. The problems with listing acts to be avoided are: 1) there are usually reasonable exceptions to any avoidance rule and 2) there is implicit approval of any act not on the list. Instead, this code provides a list of many positive actions.

These explicit actions illustrate respect for others and help strengthen both an understanding of this ethos and a commitment to it.

RULES OF CONDUCT

The GIS Certification Institute

Rules of Conduct for Certified GIS Professionals (GISPs)

Introduction
The Code of Ethics presents a set of objectives toward which we, as professionals, must continually strive. The Rules of Conduct is a set of implementing laws of professional practice that seek to express the primary examples of ethical behavior consistent with the Code of Ethics. Both the Code and the Rules govern ethical professional practice standards, and violations of either may be brought before the GISCI as an ethics issue.

The GIS professional should not interpret the lack of a specific context or act from the Rules of Conduct as permission to behave in any particular manner. For example, part of the Code of Ethics is the need to deliver an hour's work for an hour's pay. This is not simply a mandate for the office. It also means that you cannot ethically go to a conference and claim education points for the period of time when you were not actually participating in conference activities.

The Code and Rules represent a way of living a professional life, not simply how you are to behave at work. Achieving the GISP certification is an initial hurdle to jump in order to be recognized as a professional. Living the ethical life of a professional is a never ending test that will present numerous challenges for which the Code and Rules offer a guide to decision making.

The Rules of Conduct have been arranged under the headings used in the Code of Ethics as a means of indicating a primary association. The intent is to aid the user in identifying those rules that may be most applicable in a given context. Many rules, however, may be applicable in a variety of settings and situations beyond those with which they have a primary association. Any rule may ultimately be useful in resolving a specific question of ethical conduct.
NSF Project Goals

- Initial special topics, graduate seminars at OSU, PSU, Minnesota
- Transition to permanent offerings
  ✓ GEOG 864, Professionalism in GIS&T (PSU)
  ✓ GEO 567, Responsible GIS Practice: Ethics for Future Geo Professionals (OSU)
  ✓ GEOG 8291, GIS Ethics: Accuracy & Responsibility (UMn)
- Develop model curricula and associated courseware
- Disseminate open educational resources
Learning Outcomes of Courses

- Examine one’s own ideas of individual and professional responsibility
- Recognize ethical implications of geospatial technologies and applications
- Develop stronger and more sophisticated moral reasoning skills
- Understand the “moral ecologies” of the various institutions and organizations making up the geospatial enterprise
- Feel free to talk about ethics in the workplace
Pedagogical Approach

- Intro readings: philosophy, moral reasoning
- Review and discuss in-depth papers; group discussion and activities (e.g., role play)
- Examine various codes of ethics
- Interview training and analysis
- Interaction w/ working professionals via interviews
- Examine case studies
- Prepare and present original case studies
Case Study Examples

- **Mapping Muslim Neighborhoods**: A police department’s plan to map potential terrorist enclaves brings charges of racial profiling.

- **Caribou Routes**: A GIS analyst is asked to exclude pertinent data from maps prepared for a public hearing.

- **Cell Phone Tracking**: Researchers track mobile phone users’ movements (w/o their knowledge) to derive predictive models of human mobility.

- **Submarine Crash**: Inaccurate nav chart leads to deadly accident.
Case Method: Assessing Student Learning

- **Ethical sensitivity**: Ability to identify and discriminate among ethical issues
- **Ethical knowledge**: Familiarity with codes and rules
- **Ethical creativity**: Ability to see “beyond the dilemma” (*not all black & white*)
- **Judgment**: Increased likelihood that students will act appropriately (*cannot be determined in class*)
Interviews of Professionals

- Each student does 1 interview
- Develop original case from interview
- Opens door for discussion of successful or failed approaches

GIS Professional Interviews Workflow (Suggested)

- Begin interview work
- Contact interviewee
- Available?
  - Yes: Prepare for interview, Conduct Interview, Analyze interview, Finish interview work
  - No: Send consent form and question list, Confirm email receipt, and time and location of interview, Send email

Note: See syllabus for dates and more detailed information about each activity indicated here. Th. 13Sep2008

Presentation (1/4)  Prepare Interview Report (12/2)
Annotated bibliography, evaluation instruments

Summary

The National Science Foundation provided support needed to develop and institute graduate seminars at Penn State, Oregon State, and the University of Minnesota that rigorously explore ethical implications of geographic information science and technology (GIS&T). Open educational resources designed and produced by a team of professional ethicists and GIS&T educators are available from the Products section of this site.

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Extra Slides
UCGIS Model Curricula Vision

Outcomes

Supporting Topics and Integrative Experiences

GI S&T Body of Knowledge Core

Learner
BoK Knowledge Areas

AM. Analytical Methods
CF. Conceptual Foundations
CV. Cartography and Visualization
DA. Design Aspects
DM. Data Modeling
DN. Data Manipulation
GC. Geocomputation
GD. Geospatial Data
GS. GI S&T and Society
OI. Organizational and Institutional Aspects
BoK Knowledge Areas and Units

Knowledge Area AM. Analytical Methods
Unit AM1 Academic and analytical origins
Unit AM2 Query operations and query languages
Unit AM3 Geometric measures
Unit AM4 Basic analytical operations
Unit AM5 Basic analytical methods
Unit AM6 Analysis of surfaces
Unit AM7 Spatial statistics
Unit AM8 Geostatistics
Unit AM9 Spatial regression and econometrics
Unit AM10 Data mining
Unit AM11 Network analysis
Unit AM12 Optimization and location-allocation modeling

Knowledge Area CF. Conceptual Foundations
Unit CF1 Philosophical foundations
Unit CF2 Cognitive and social foundations
Unit CF3 Domains of geographic information
Unit CF4 Elements of geographic information
Unit CF5 Relationships
Unit CF6 Imperfections in geographic information

Knowledge Area CV. Cartography and Visualization
Unit CV1 History and trends
Unit CV2 Data considerations
Unit CV3 Principles of map design
Unit CV4 Graphic representation techniques
Unit CV5 Map production
Unit CV6 Map use and evaluation

Knowledge Area DA. Design Aspects
Unit DA1 The scope of GI S&T system design
Unit DA2 Project definition
Unit DA3 Resource planning
Unit DA4 Database design
Unit DA5 Analysis design
Unit DA6 Application design
Unit DA7 System implementation

Knowledge Area DM. Data Modeling
Unit DM1 Basic storage and retrieval structures
Unit DM2 Database management systems
Unit DM3 Tessellation data models
Unit DM4 Vector and object data models
Unit DM5 Modeling 3D, temporal, and uncertain phenomena

Knowledge Area DN. Data Manipulation
Unit DN1 Representation transformation
Unit DN2 Generalization and aggregation
Unit DN3 Transaction management of geospatial data

Knowledge Area GC. Geocomputation
Unit GC1 Emergence of geocomputation
Unit GC2 Computational aspects and neurocomputing
Unit GC3 Cellular Automata (CA) models
Unit GC4 Heuristics
Unit GC5 Genetic algorithms (GA)
Unit GC6 Agent-based models
Unit GC7 Simulation modeling
Unit GC8 Uncertainty
Unit GC9 Fuzzy sets

Knowledge Area GD. Geospatial Data
Unit GD1 Earth geometry
Unit GD2 Land partitioning systems
Unit GD3 Georeferencing systems
Unit GD4 Datums
Unit GD5 Map projections
Unit GD6 Data quality
Unit GD7 Land surveying and GPS
Unit GD8 Digitizing
Unit GD9 Field data collection
Unit GD10 Aerial imaging and photogrammetry
Unit GD11 Satellite and shipboard remote sensing
Unit GD12 Metadata, standards, and infrastructures

Knowledge Area GS. GI S&T and Society
Unit GS1 Legal aspects
Unit GS2 Economic aspects
Unit GS3 Use of geospatial information in the public sector
Unit GS4 Geospatial information as property
Unit GS5 Dissemination of geospatial information
Unit GS6 Ethical aspects
Unit GS7 Critical GIS

Knowledge Area OI. Organizational and Institutional Aspects
Unit OI1 Origins of GI S&T
Unit OI2 Managing the GI system operations and infrastructure
Unit OI3 Organizational structures and procedures
Unit OI4 GI S&T workforce themes
Unit OI5 Institutional and inter-institutional aspects
Unit OI6 Coordinating organizations (national and international)
Ethics in the *Body of Knowledge*

**Unit GS6 Ethical aspects**

Ethics provide frameworks that help individuals and organizations make decisions when confronted with choices that have moral implications. Most professional organizations develop codes of ethics to help their members do the right thing, preserve their good reputation in the community, and help their members develop as a community.

**Topic GS6-1 Ethics and geospatial information**

- Describe a variety of philosophical frameworks upon which codes of professional ethics may be based
- Discuss the ethical implications of a local government’s decision to charge fees for its data
- Describe a scenario in which you would find it necessary to report misconduct by a colleague or friend
- Describe the individuals or groups to which GI S&T professionals have ethical obligations

**Topic GS6-2 Codes of ethics for geospatial professionals**

- Compare and contrast the ethical guidelines promoted by the GIS Certification Institute (GISCI) and the American Society for Photogrammetry and Remote Sensing (ASPRS)
- Describe the sanctions imposed by ASPRS and GISCI on individuals whose professional actions violate the Codes of Ethics
- Explain how one or more obligations in the GIS Code of Ethics may conflict with organizations’ proprietary interests
- Propose a resolution to a conflict between an obligation in the GIS Code of Ethics and organizations’ proprietary interests
Ethics in the *Body of Knowledge*

**Unit GS7 Critical GIS**

Many of the educational objectives used to define topics in this knowledge area, and in the Body of Knowledge 2006 as a whole, challenge educators and students to think critically about GI S&T. Since the 1990s, scholars have criticized GI S&T from a wide range of perspectives. Common among these critiques are questioned assumptions about the purported benefits of GI S&T and attention to its unexamined risks. By promoting reflective practice among current and aspiring GI S&T professionals, an understanding of the range of critical perspectives increases the likelihood that GI S&T will fulfill its potential to benefit all stakeholders. Philosophical, psychological, and social underpinnings of these critiques are considered in Knowledge Area CF: Conceptual Foundations.

**Topic GS7-2 Ethical critiques**

- Defend or refute the argument that the GI S&T professionals are culpable for applications that result in civilian casualties in warfare
- Defend or refute the argument that the “digital divide” that characterizes access to GI S&T perpetuates inequities among developed and developing nations, among socio-economic groups, and between individuals, community organizations, and public agencies and private firms
- Discuss the ethical implications of the use of GI S&T as a surveillance technology
Textbook Example

Ethics
for the information age
3rd edition
Michael J. Quinn
What is Legal May Not be Ethical