Ethics, Information Technology and Today's Undergraduate Classroom

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ABSTRACT

This paper highlights interdisciplinary research grounding a course that is one of the core requirements of a new undergraduate informatics curriculum. *Ethics and Information Technology* explores the ethical dilemmas that exist where human beings, information objects, and information systems interact. The course tests the notion that the most effective way to explore how new technologies relate to integrity, truthfulness, trust, respect for privacy and individuality is to become immersed in a technological environment where unethical behavior as well as ethical norms can be safely and confidentially tested, evaluated, observed, and experienced. The paper will summarize an emerging literature in three areas: (1) the theories of ethics and information technology, (2) the characteristics of the "Net Generation" regarding the use of new technologies, and (3) the central role played by "trust" in assessing the ethical implications of new technologies, including online multiplayer games, image editing, collaborative authoring, and open source coding conventions. The paper will then demonstrate how this literature informs the design and implementation of the course.

Topics

Information policy, ethics and law

Keywords

Undergraduate education, Information ethics, Pedagogy

1. INTRODUCTION

A new course, *Ethics and Information Technology,* is a significant contribution by the University of Michigan's School of Information to a new undergraduate concentration in Informatics. The course is one of four required core courses for the newly approved major, which itself represents a deep collaboration among faculty across three University schools. The uniqueness of the undertaking raises the stakes, challenging the faculty of each

school to define a rich field of study in ways that resonates intellectually across the entire partnership. The nature of this cross-campus collaboration influences the design of new courses, as well as the approaches to undergraduate education. *Ethics and Information Technology* tests the notion that the most effective way to explore how emerging technologies relate to information ethics is to immerse students in a technological environment where unethical behavior as well as ethical norms can be safely and confidentially tested, evaluated, observed, and experienced. In this regard, the course exists at the intersection of technology, ethics, and pedagogy. This paper frames the principal theoretical issues that underlie the design of the course and outlines its most salient pedagogical features.

2. CONTEXT

"Ethics" is variously defined [O.E.D.] as a branch of philosophy concerned with evaluating human action, the study of individual or group values, or a system of defining right and wrong behaviors. When applied to the professions, ethics defines a code of standards governing fair and responsible conduct with other members of a profession and the general public. In association with computer and information technologies, ethics concerns the relationship of systems with the people who use them. [14] Most recently, the concept of information ethics has extended philosophical consideration well beyond the human behavior to explore the ethical properties of information objects. [9]

The study of ethics within the context of information technology is international in scope. The International Center for Information Ethics (ICIE) identifies 104 individuals in over 90 organizations around the world whose primary field of scholarship and teaching is information ethics, with Germany, Japan, the United Kingdom, and the United States having a particularly strong presence in the field. [13] For the United States, ICIE's selective database lists 32 individuals in 30 universities with a primary focus on information ethics research. Nearly a dozen scholarly journals, continuing sequences of international conferences, and highly touted monographs and compendiums attest to the deepening scholarly interest in ethics and emerging technologies.

The teaching of ethics has traditionally been an important element of the university curriculum. The University of Michigan's Ethics in Public Life Initiative, for example, has compiled a current list of over 300 regularly-scheduled courses that involve ethics as a substantial component. [22] Academic disciplines offering these courses range from the traditional and obvious (e.g., philosophy) to the more subtle and nuanced (e.g., environmental studies). Every professional school at Michigan offers at least one course

at the graduate level focused on either professional ethics or ethics policies appropriate to the profession. Those professional schools that offer undergraduate courses or degrees include, but do not necessarily require the study of ethical issues to complete a major.

Ethics in the iSchools, however, presents a paradox. Ethics is simultaneously a core principle governing the formulation of their teaching missions and a minor or peripheral area of research. On the one hand, the websites for all of the 19 iSchools describe ethics as one of their important areas of concern. Nearly all iSchools offer specific graduate-level courses that include an investigation of either professional ethics or ethics policy issues. And yet, six of the 19 members of the consortium of iSchools account for a total of only eight faculty in the ICIE database of research specialists in information ethics. Although the ICIE database does not reflect the efforts of faculty who primarily or exclusively teach ethics, it is clear that research on ethics is not at this point in time a central research or teaching strength of most iSchools.

3. A FRAMEWORK

The undergraduate course *Ethics and Information Technology* exists at the intersection of three distinctive concepts: (1) the philosophy of ethics, (2) the social characteristics of emerging information technologies, and (3) the learning styles of a particular cohort of students. Although literature on the theoretical foundation for each of these areas is vast, there is a particular
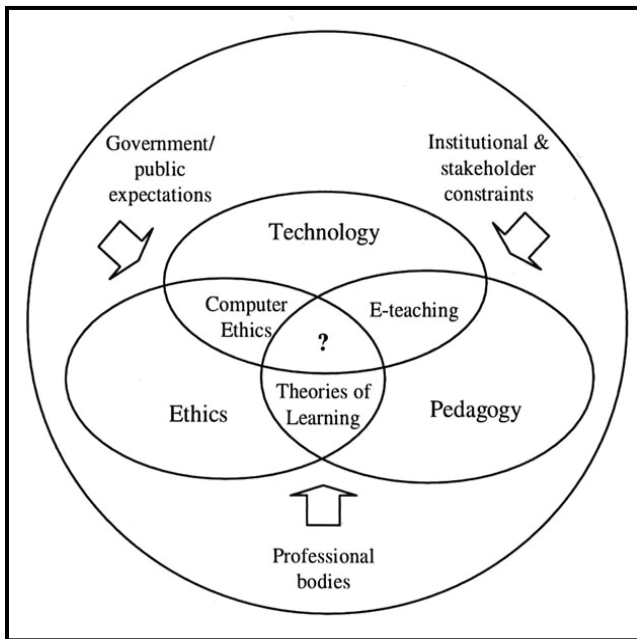

Figure 1. The links between technology, pedagogy and ethics

absence of literature that addresses the theoretical foundations challenges at the intersection. McRobb, Jefferies and Stahl [16] propose a framework that describes research findings in the areas where the concepts overlap and establishes a domain where the concepts of ethics, technology, and pedagogy are most dynamic. Figure 1 is the authors' graphic illustration of their framework.

The McRobb framework and its supporting literature is oriented toward the ethical issues involved in distance learning, drawing for support on the literature of computer supported collaborative learning. The conceptual model represented by the McRobb illustration, however, provides a convenient mechanism for highlighting how the issues that are at the heart of the Michigan course overlap and intersect. The framework includes three pressures that constrain the content of the three issue areas, among them the expectations of a wider audience regarding the evolving role of ethics education in the academy, the limitations imposed by university technology systems, and perspectives of various professional bodies or academic disciplines on the appropriate approaches to ethics education. Each of these constraining issues is at work in the design of a course that purports to exist outside the boundaries of the existing curriculum. Ethics and Information Technology is not only a new course but one that straddles and attempts to incorporate the perspectives of the three disciplines that are contributing to the new Informatics curriculum.

The framework is most relevant in identifying three distinctive intellectual spaces where conceptual overlap creates interesting new perspectives. First, the boundary where the study of ethics and the characteristics of emerging technology overlap, labeled in the figure as "Computer Ethics," provides a set of useful ethical models that are the intellectual structure of course. Second, the boundary where ethics and pedagogy overlap orients the course's interactive design and the flow of the individual course modules. Third, the boundary where technology and pedagogy overlap provides the rationale for an immersive technology environment in which students and instructor model the challenges posed by a suite of technologies.

4. ETHICS AND TECHNOLOGY

Scholarship on the relationships between information technology and ethical beliefs and behaviors have been debated and refined for the past fifty years. How this scholarship informs the teaching of these relationships is less well understood.

Terrell Bynum [1] credits the American philosopher/scientist Howard Weiner (the founder of the science of cybernetics) with foreseeing the enormous ethical and social impacts of information technology and laying the groundwork for the study of computer ethics. Writing in the 1950s, Wiener grounded his ethical theories of computer technology in the view that human beings are complex information feedback system that govern their relationships with other humans and the world around them. Drawing on Aristotle and flowing through Weiner's systems perspective, Bynum proposes that the purpose of human life is to flourish as a person [2] and to do so through a diversity of information processing activities. In this regard, the principal value of information technology is to extend human potential by reinforcing the principles of freedom, equality, and benevolence. Weiner simultaneously defined the ethical underpinnings of Vannevar Bush's Memex and anticipated the collaborative social technologies of Douglas Englebart. Bynum and others see the culmination of Wiener's vision of "flourishing ethics" in the theoretical constructs of Luciano Floridi's "Infosphere." [8]

James Moor is a bridge from the discipline of computer ethics to the broader world of information ethics. Moor [18] initially defined computer ethics in terms of a policy vacuum that occurs

when "new technological capabilities provide new choices for action in an environment where existing policies seem inadequate." Computer ethics includes consideration of both personal and social policies for the ethical use of computer technology. Writing twenty years later, following the explosion of the World Wide Web and the emergence of widespread social computing applications, Moor called for a more flexible and agile approach to investigating the relationship of new technologies to human ethical behavior.

Moor [19] establishes a three part progressive model of technology development that relates the maturity of revolutionary technology to increasing ethical complexity. According to his model more people will be involved, more technology will be used, and hence more policy vacuums and conceptual muddles will arise as the revolution advances." In the case of emergent (immature or experimental) technologies, such as the socially oriented tools and systems typified by the over-used moniker Web 2.0, Moor postulates his own "Law," which states that "as technological revolutions increase their social impact, ethical problems increase," because revolutionary technology provides many new opportunities for action "for which well thought out ethical policies will not have been developed." Moor lays out three approaches to study new technologies from an ethical perspective, including investigating new technologies before they have stabilized, using multi-disciplinary approaches to research, and adopting sophisticated ethical analyses to avoid the tendency to revert to simplistic cost/benefit analyses that translate ethical choices into monetary terms. "We need to learn about the technology as it is developing and to project and assess possible consequences of its various applications." The Michigan course places students into a policy-weak environment populated by technologies whose use and abuse are not fully understood.

An important open question at the intersection of ethics and technology is whether the social dynamics of new technologies are generating new ethical models of behavior. In addressing this question, Himma [11] focuses on the role of ethics in informed decision making. He reviews and ultimately dismisses claims that computer ethics has a claim to theoretical uniqueness. "Understanding computing technologies will help to produce well-informed ethical views – regardless of how we characterize those technologies."

Rafael Capurro [4] adds another dimension by highlighting the nature of the content that is embedded in or made accessible by networked technologies. He argues for a holistic view of information that is attentive to the mass transformation/transition of content from analog to digital. "In this broader sense information ethics deals with questions of digitalization, i.e., the reconstruction of all possible phenomena in the world as digital information and the problems caused by their exchange, combination and utilization." Capurro makes an essential connection between communication technologies and the human propensity to share and preserve. A basic moral principle of the information environment, he claims, "is to share knowledge, or the right to communicate in a digital environment which includes the right to preserve what we communicate for future generations." Capurro reminds us that the appropriation of modern information technology is not just a technical also but a culturally-bounded endeavor.

Luciano Floridi [9] presents, perhaps, the most well developed philosophical perspective on the ethical issues associated with information and communication technologies. Floridi's "Infosphere" encompasses not only cyberspace but also off-line and analog information spaces. Adopting an object-oriented approach to the design of a new ethical model, Floridi defines moral action as a "dynamic system" arising out of the interaction of seven principal components: 1) the agent, 2) the patient, 3) their interactions, 4) the agent's general frame of information, 5) the factual information concerning the situation that is at least partly available to the agent, 6) the general environment in which the agent and patient are located, and 7) the specific situation in which the interaction occurs. Drawing deeply on environmental physics, Floridi restates that the fundamental principles (or rules) of this dynamic system are grounded in the notion of information entropy – that is the destruction, pollution and depletion of information objects – ought not to be caused, ought to be prevented, ought to be removed, and ought to be protected, extended, improved, enriched and enhanced. [7] Information ecology as a parallel. Floridi's model and the norms it proposes structure the flow of the Michigan course.

The real question for the intersection of ethics and technology is the extent to which new technologies and the ways that people use them foster new rules of ethical behavior (perhaps culturally determined) or whether long standing principles are transferred to new technological contexts. The pedagogical focus of the course is designed in part to explore this issue dynamically and interactively.

5. NET GENERATION PEDAGOGY
A course that examines ethical issues associated with new technologies must necessarily take account of the learning styles and the general attitudes of the undergraduates who enroll. The conceptual design of the course, as well as its intellectual flow of the individual modules and use of technology tools in and outside the classroom are in part predicated on the notion that today's generation of undergraduates is somehow different than previous generations.

Allowing for fluidity in the boundary lines, a case can be made that at any point in time, generational cohorts bound by shared experiences and history exhibit behavioral and attitudinal cohesion. Commentators have labeled the generation of students born since 1981 (a somewhat arbitrary point in time) as the Net Generation, in part because they have grown up with the widespread availability of personal computers and the Internet. Strauss and Howe [21] characterize the members of the Net Generation as sheltered and protected but pressured to excel, endowed with a strong sense of their own specialness (indicated by high self-esteem), confident, and optimistic. They may be more team oriented than previous generations, more comfortable than average with multi-tasking, and very literate in the realm of digital and visual technologies. Gibbons [10] argues that the affinity of today's undergraduates for information technology "translates into new and different expectation about how to gather, work with, translate, and share information."

The apparent naturalness with which undergraduates embrace new technologies leads some commentators to see technological determinism at work. Lippincott [15] argues that "digital natives"

have acquired styles of learning and modes of interpersonal interaction as a direct result of the availability of network technologies, suggesting that the implications of this fact extend beyond the classroom to challenge and change the mission and purposes of libraries and other information services. Nye [20] and most scholars of the history of science and technology reject the deterministic thesis, arguing instead that "people become enmeshed in a web of technical choices made for them by their ancestors," helping to explain why people may seem trapped by the choices others have made.

The design of the Michigan course rejects a deterministic view of the technologies it utilizes but starts with the premise that there are generational differences in the perspectives of students and teachers. Such differences may be manifested genuinely in varying comfort levels with new and emerging technologies. But the course's structure, flow, and assessment methodologies leave open the question of whether Net Generation learners harbor a distinctive ethical world view in the use of these technologies.

6. THE CENTRALITY OF TRUST

The McRobb et al. framework (Figure 1) places a question mark at the center of its analytical framework where ethics, technology, and pedagogy meet. In their review of the associated research literature, the authors found that "there seems to be little interest in the exploration of the intersection of those areas…What appears to be lacking is a good overview of the relationships of the different issues involved." [16]

In adapting the McRobb framework, course designers used the concept of "trust" as an organizing principle for the individual modules. The O.E.D. defines trust as: "confidence in or reliance on some quality or attribute of a person or thing, or the truth of a statement." In placing trust at the intersection of ethics, information technology, and pedagogy, the Michigan course opens students to an examination of trust from multiple perspectives, for example trust in individual identity, trust of the integrity of digital content, trust in the transparency of open source code and the community of people who create it. As the case studies in Hutchings [12] demonstrate, the notion of trust also enters into the dynamic engagements between teacher and student, as well as student to student interactions inside and outside of class.

In terms of identity with the context of the course, Buchanan and Ess [3] demonstrate that trust bears on the extent to which behavior within a virtual environment is conditioned by knowledge of the identity of the agents within the environment. The creation, modification, and behaviors of avatars in an online environment is a particularly apt example of identity trust. Chesney [5] follows the same line of reasoning in examining the trust metrics underlying such collaborative writing efforts as Wikipedia.

In terms of content, trust is intimately related to the notion of "integrity," which Duranti [6] defines universally for textual documents in terms of reliability and authenticity. "It is generally accepted by all literate civilizations that documents are trustworthy (that is, *reliable*) because of their completeness and controlled procedure of creation, and which are guaranteed to be intact and what they purport to be (that is, *authentic*) by controlled procedures of transmission and preservation, can be presumed to be truthful (that is *genuine*) as to their content." Mitchell [17] reaches a less technical but no less measurable conclusion in reference to trust in visual content. "If an image follows the conventions of photography and seems internally coherent, if the visual evidence that it presents support the caption, and if we can confirm that this visual evidence is consistent with other things that we accept as knowledge within the framework of the relevant discourse, then we feel justified in the attitude that seeing is believing."

7. DESIGNING A COURSE

As conceived at Michigan, *Ethics and Information Technology* is one of four courses of a new undergraduate concentration in Informatics. The multidisciplinary concentration is a collaborative undertaking among faculty from the university's Computer Science & Engineering division within the College of Engineering, the Department of Statistics within the College of Literature, Science and the Arts (LSA), and the School of Information. The undergraduate concentration is based in LSA but draws on faculty from all three schools. Program development is led by a steering committee of two senior faculty from each of the participating schools. *Ethics and Information Technology* is guided by the collaborative spirit of the faculty development team, but is being designed and will be taught by a team of two faculty, one from the College of Engineering and one from the School of Information.

Ethics and Information Technology explores the ethical dilemmas that exist where human beings, information objects, and information systems interact. Modular in design, the course introduces students to a variety of ethical models from historical and cross-cultural perspectives and then explores the relevance of these models to a variety of new and emerging technologies that are inherently social in their construction and use. Initial examples of issues that the course covers in discrete modules include:

- interpersonal engagement through online games and virtual environments,
- the integrity of digital content in a networked world, and
- tradeoffs between security and openness of code, data, and information systems.

Students explore the technological underpinnings of associated technology systems, experiment with individual and group interaction with technologies, and examine the mechanics of ethical and unethical behaviors.

The course has two major instructional objectives: (1) integrate opportunities for direct hands-on technical experiences, in order to enhance understanding of ethical challenges presented by new information technologies, and (2) offer opportunities to participate via in-class discussions, short posts submitted to an online discussion board, and longer written assignments; in order to encourage multimodal contributions by students. Associated with the objective are three related learning outcomes: (1) demonstrate knowledge of current theories in information ethics; (2) apply ethics theories to interpret behavior when using a variety of information technology tools; and (3) evaluate the nature of ethical choices made by self and others when serving various roles.

New information technologies raise knotty issues regarding integrity, truthfulness, trust, respect for privacy and individuality, as well as the variations in ethical behavior across gender, racial and ethnic group, socioeconomic class, sexual orientation, and global cultures The course tests the notion that the most effective way to explore these issues is to become immersed in a technological environment where unethical behavior as well as ethical norms can be safely and confidentially tested, evaluated, observed, and experienced. The course will mix experiential learning with individual and group interaction with a variety of technologies.

This course is unique in its construction and in its mix of technological tools for instruction. Although a vibrant literature is emerging on approaches to teaching ethics and information technology and on the use of technology in the classroom, relatively little is known about learning processes and learning outcomes in the combination of ethics and emerging social technologies. The course will, in part, form a test environment for learning about how to use innovative technological tools to teach about the ethical dilemmas posed by these same technologies. Significant instruction takes place with the aid of technological tools available through an online virtual environment build on the Sakai platform that most University of Michigan students recognize as CTools.

7.1 Example: Module Assignments

Assignment 1: *Virtual Environments:* **Anonymity**

Students will create an avatar in a virtual world and adopt an anonymous persona. They will interact with their classmates in a secure environment over a period of several days, and then attempt to guess which student each avatar represents. Students will maintain awareness of such factors as whether they encountered any challenges in maintaining anonymity on a long-term basis; whether they employed confounding strategies to actively deter detection; how frustrated they were by others' anonymity; whether their anonymous status conferred a sense of freedom to behave transgressively; the extent to which their or others' personalities were identifiable through language, appearance, or gestures, etc. What are some of the unexpected disadvantages of anonymity in this environment? Apply ethical theories discussed in class in your analysis.

Assignment 2: *Virtual Environments:* **Cheating**

Students play videogames with colleagues: (1) cooperatively as a member of a team, and (2) competitively in an individual PvP exercise. (1) Students on each team first must discuss and decide as a group whether their team will collectively condone and engage in cheating behaviors in order to advance their progress, and note the results generated by their decision whether or not to cheat. Each team also must determine whether they have identified evidence of cheating by their opponents, and if so, what their response will be in return. (2) As individual players, students will be encouraged to cheat in one-on-one interactions in order to succeed. They must note their emotions, as well as their intellectual rationalizations, when engaging in transgressive behavior. Is the game more or less enjoyable when both players are known to be cheating? Apply ethical theories discussed in class in your analysis.

Assignment 3: *Information Integrity:* **Critical judgment**

In a three-part exercise, students examine a set of photographic images to which various enhancement algorithms and editorial techniques have been applied. Working in teams of two to four individuals, students will then categorize a set of existing digitized photo images according to a four part rendering scheme and evaluate the truthfulness of the images within the scheme. Finally, students will assess how meaningful and trustworthy are a set of images in an online exhibit by comparing and contrasting the messages of the image with the messages of the accompanying text.

Assignment 4: *Information Integrity:* **Collaborative editing roll playing**

Students will be assigned randomly to one of four roles: known author; anonymous author; known editor; anonymous editor. Students will play their roles in creating and editing content in a class-limited wiki. Topics chosen for creation and editing will be determined by the class. Students will be given explicit assignments regarding the submission of truthful and untruthful content and on the "rules of engagement" for adding, editing, and deleting content. Students will log their activities and seek to create together a set of trustworthy wiki entries. Discussion during and after the exercise will explore the challenges of establishing and keeping trust.

Assignment 5: *Secrecy and Openness:* **Cryptography**

The purpose of assignment is to assess the level of knowledge of the cryptography section of this course. An exam on the topic will be offered. The exam key will be posted on the CTools site *in advance* of the students taking the exam. However, the key will be posted in an encrypted form. The students will *not* be told which encryption scheme was used for encoding. Students will have the choice of studying for the exam in a traditional way, or putting their effort towards decrypting the answer key and guaranteeing full credit on the exam.

Assignment 6: *Secrecy and Openness:* **Role playing**

Homework is a role-playing assignment. Students are given a list of 'artifacts' of varying levels of importance to them personally, and to society in general. Students will then be asked (individually or in groups) to prioritize artifacts in terms of importance and need for secrecy. The initial evaluation will be from their current perspective as a UM student. Next, students will be randomly assigned a role for role-play. Students will again be asked to prioritize artifacts and reflect upon any changes in their prioritization scheme.

8. CONCLUSION

The design and implementation of an innovative course on ethics and information technology is a somewhat risky undertaking. First, we do not yet know of the market for the concentration and the extent to which the new course will both attract students to the concentration and fulfill critical learning objectives for the new Informatics Program. Second, we cannot anticipate the extent to which experiential teaching in the domain of ethics and information technology will lead to specific learning outcomes. Toward this end, the course instructors have partnered with the university's Center for Research on Learning and Teaching to develop assessment metrics new student feedback mechanisms. Third, we are not sure that the course will or should result in behavioral changes in the students who complete the course. We

believe the risk of failure (measured by either low enrollment or low student evaluations) is offset by the opportunity to create a learning environment that serves as a model laboratory for new research on teaching ethics at the undergraduate level.

9. ACKNOWLEDGMENTS

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