Assessing the Impact
of a Technology Ethics Course

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Abstract

Ethics is an important subject in the curriculum for all students who create and use technology. Developing and teaching a technology ethics course presents many challenges. One challenge is assessing the impact of the course. During the course students may participate in reading, writing, discussions, and other activities where they consider the ethical aspects of different situations. This work can be assessed as part of the course, but how can we assess whether students are applying what they learn beyond the ethics classroom? In this paper, I will discuss efforts to revise a technology ethics course and assess the impact on students.

Keywords: IT Ethics, Pedagogy, Assessment

1. INTRODUCTION

Ethics is clearly an important part of the Computer Science, Information Technology and Information Systems curriculum. This can be seen from its inclusion in model curricula for all of these fields (Information Technology 2008; IS 2010; Joint Task Force, 2013). The importance of ethics in these fields can also be seen from the effort that professional organizations, such as ACM, have made in developing and discussing a professional code of ethics (ACM Code of Ethics, n.d.; Anderson, Johnson, Gotterbarn, & Perrolle, 1993).

When developing and teaching an ethics course, the initial challenges are to have a clear idea of the goal of the course, and then how to teach the course (Schwartzman, 2005). Unlike many courses in the CS/IT/IS curriculum, ethics is not a topic where there are clear rules, syntax, algorithms, or required results for students to learn and then apply in writing programs and activities of increasing complexity. Rather, ethics is a topic where students need to explore situations, engage in discussions with others, and take and defend a position.

Two important components of teaching any course are assessing the results to understand whether the course is achieving the desired outcomes and updating the course to keep it current and improve outcomes. While there is ongoing discussion of how ethics is being included in the curriculum and ideas for teaching the subject (Hare, 2008; Howard, 2007; Kortsarts & Fischbach, 2014), there is limited discussion on how the impact of ethics education can be assessed. This paper makes an effort to contribute to this discussion by documenting an effort to revise a technology ethics class and assess the course by looking at the effect it has on students' awareness and behavior related to topic areas from the class.

2. ASSESSMENT

Assessing ethics education offers several challenges. First, discussions on the ethics of a situation can be complex and will depend on the cultural and societal backgrounds of those

involved in the discussion. Additionally, ethics is a personal subject, so assessing the impact of an ethics course could involve evaluating a student's core values, unlike other technology courses that assess the quality of abstract technology built by a student.

Approaches that are used for assessing other courses in the IS/IT curriculum are not appropriate in this situation. For technical subjects, later courses in the curriculum build on earlier courses, offering a clear way to assess whether students have retained material learned in the earlier course. In addition, it is possible to assess whether students are able to apply knowledge learned from earlier courses to new situations. Since ethical topics are diffused throughout the curriculum, it is not clear how to apply a similar assessment approach to the topic of ethics.

Another useful assessment method is development of an assessment instrument that can be used pre/post testing. There has been some effort to develop an assessment instrument for use in scientific and engineering situations (Borenstein, Drake, Kirkman, & Swann, 2010). This instrument is based on assessing responses to technical dilemmas in science and engineering, so it is not clear how applicable it is to the IS/IT field.

The same group has worked on an instrument to assess awareness of ethical issues, and has developed the Test for Ethical Sensitivity in Science and Engineering (TESSE) to assess this (Borenstein, Drake, Kirkman, & Swann, 2008). This instrument again uses cases appropriate to science and engineering, so may not be appropriate for IS/IT technology ethics.

Without a clear method of applying existing assessment techniques, it is useful to step back and consider what are the goals of the technology ethics course, or what is the course trying to teach? Reflecting on this, we realize that despite the title, the course is not trying to teach ethics, but is rather starting with students who have learned ethical behavior throughout their lives (although they might not previously have reflected upon how they decide on those behaviors) and asking them to think about ethical issues raised by technology.

The class discussed in this paper uses this approach. Students learn about specific topics, discuss cases with their fellow students, take a

position, and support it with reasoned arguments and analysis using established ethical theories, such as Kantianism, act utilitarianism, and rule utilitarianism. These efforts can be assessed within the context of the class, but it is hard to assess whether students continue these activities outside of the course.

With rigorous assessment presenting challenges, an effort to further understand the impact of the ethics course was seen as a starting point. This effort sought to understand whether the course caused students to change how they interacted with ethical situations involving technology outside of the classroom. Specifically, do students report increased awareness of how issues discussed in the class affect them and have they changed their behavior in response to topics discussed in the course?

3. THE COURSE

Technology, Ethics, and Global Society is a course that all students majoring in Information Technology or Computer Science are required to complete. The course can also be used to satisfy a Humanities or Social Science requirement as part of the university's liberal education requirements. The goals of the liberal education plan are thinking critically, understanding contexts, engaging with other learners, and reflecting and acting. Before students can enroll in the course they must have completed the university's required composition and rhetoric course and have completed 20 credit hours.

The course is taught in a hybrid format with in-person class meetings once a week for an hour and twenty minutes. Outside of class students participate in additional online activities. The four course sections studied for this work had initial enrollments of 20 – 24 students with roughly half of the students in each section majoring in information technology or computer science.

The first class meeting serves as an introduction to the course and immediately involves students in small group discussions about ethical questions. The remainder of the course consists of eight modules covering the first eight chapters in the text, Ethics in a Computing Culture (Brinkman & Sanders, 2013).

Each module requires the students to read a chapter in the text, complete a short online quiz based on the reading and participate in one or two online discussions related to the module content.

These prepare students for in class activities involving small group discussions on cases related to the module topic. As part of the class, the groups were required to summarize their discussions of the ethical aspects of the case for the rest of the students in the class and respond to questions from the rest of the class and the instructor.

The course also included several other activities including a number of short written assignments, three longer (3 – 5 pages) position papers, a short group project, and a longer group project that students presented on the final day of class (Howard & Woods, 2015). While a wide range of ethical theories were covered in the first course module, course discussions and assignments focused on three, Act Utilitarianism, Rule Utilitarianism, and Kantianism, that provided clear approaches for developing and supporting an ethical argument.

As others have mentioned (Hare, 2008), there are many opportunities to include current events in an ethics course. This was done through brief discussions at the beginning of class and through some of the small group discussions in class. In addition, current events often appeared in the final group projects.

4. IMPACTING STUDENTS

Over several semesters of teaching this course, it was noted that there are several topics where students actively engage in discussions on a topic and identify ethical issues with the current situation. However, at times it seemed that other than expressing concerns, students felt resigned to the current situation. For example, students often identify ethical issues with how their personal data is collected and used by web sites, but see no way to control this other than the extreme step of not using the internet. To address this, an effort was made to update some of the in-class small group discussions to add content that provided ideas that students might act on. Initial efforts have focused on the privacy and intellectual property modules.

This effort to update the course involved updates to the course content, but also needed to include a method for evaluating the results of the updates. This prompted the reflection on assessment discussed previously.

Privacy

One area where changes were made was the privacy module. Privacy is affected by decisions and actions in collecting, storing, and using data. The existing material from the text provided a good background on privacy, especially the ambiguous nature of legal protection of privacy in the United States. The text also introduced Solove's taxonomy of privacy problems (Solove, 2008) as a tool that could be used to identify the causes and effects of common privacy problems.

In the privacy module, students researched and discussed the Patriot Act. This topic provides a wealth of material for discussing the balance between security and privacy. Students also watched the movie *Erasing David* (Erasing David, n.d.) that tracks the efforts of journalist David Bond to disappear while a pair of private investigators try to track him down. The film is set in Europe and illustrates differences between European and US data protection laws. One scene in the movie shows David reviewing the results of requests enabled by the European Data Protection directive (Protection of Personal Data, n.d.) for data that major companies have collected on David and his family. Students regularly comment on the volume of data that David receives as a result of his requests. The detail recorded in this data is also surprising, with David finding that on a specific date he was apparently "angry." To build on student interest in this, two new small group discussion items were developed.

The first asked students to consider the question of identity by discussing what information close friends and family know about them and consider whether companies they interact with may also know some of this information. This leads to interesting observations that their local grocery store chain may know information such as their favorite brand of breakfast cereal, that only close friends and family would also know. The discussion also leads to the observation that it is hard to distort the image presented to close friends and family, while it can be much easier to present a distorted image to people and companies that we only interact with through technology. As one student noted "On Facebook my life is perfect."

The second discussion introduced had students learn more about the European Union Data Protection Directives and the Organization for Economic Cooperation and Development (OECD) recommendations for protection of personal data

(Protection of Personal Data, n.d.; OECD Guidelines, n.d.). Students found these to be easy to understand and thought they could help resolve many of their concerns about how data is collected and processed in the US. In their small group discussions on this topic, students came up with many interesting observations, including that the European directives already apply to many large companies that do business in the United States.

Intellectual Property
In the module on intellectual and intangible property, the text again provided good background material on the different types of intellectual property that are protected in the United States along with a discussion on the legal means for protecting intellectual property.

Online and in-class discussions allowed students to explore specific topics including the patentability of algorithms, questions about music licensing, fair use of copyright, and plagiarism in the era of the web. Students also explored intellectual property questions through a small group movie project. Groups of 4 – 5 students watched either *The Social Network* (the creation of Facebook) or *Flash of Genius* (the story of Robert Kearns, inventor of intermittent windshield wipers) and developed a brief (10 minute) in-class presentation discussing intellectual property issues from the movies.

This module also included discussions related to the fact that students are regularly creating their own intellectual property as well as making use of intellectual property created by others. Examples include creating written or multimedia projects for courses where they might make use of images and video clips found on the internet as well as the different software tools used to create these projects. Changes were made to several small group discussions to focus on several ideas that could help students make better use of their own and other's intellectual property. New or revised topics included Creative Commons licensing (About the Licenses, n.d.), orphaned works, manipulation of images, and the use of free and open source software.

Technology's Impact on Society
Considering the impact that technology has on our society was the main focus of one module, but was also a pervasive theme in several other course modules. In addition to the privacy and intellectual property modules, the impact of technology was also explored in modules on trust, safety, and reliability; democracy, freedom of speech, freedom of the press, and computing and vulnerable groups. Throughout these modules students offered many interesting observations. They observed that while technology offers new ways to build connections with people around the world, technology can also reduce physical interaction with family, friends, and others. Online harassment and cyberbullying are frequent topics for final projects. Students also observed how easy it is to observe similarities between some individuals' uses of technology and behaviors that may be considered addictive.

Another interesting observation that students identify is how technology is training us. For example, when presented with the terms and conditions for a web site or app, how many people actually read the text, rather than just looking for where they must click to move on with using a site or app?

5. ASSESSING IMPACT

To evaluate how students were affected by the course material, an end of semester survey was developed. The survey focused on three areas – privacy, intellectual property, and how technology impacts society. The survey also assessed whether students reported prior knowledge of the ethical theories used in the class and whether they found these theories to be useful outside of the class. With the exception of the question about prior knowledge of the ethical theories, all questions used a five-point Likert scale.

In assessing the impact related to privacy, intellectual property, and the impact of technology on society, questions focused on student's awareness of how these topics might affect them and whether they had taken any action in response to knowledge gained in the class.

The survey was initially administered during the Fall of 2015 using the university's Qualtrics online survey tool. The survey was distributed during the last week of the semester to all students in three course sections. A total of 22 of the 51 (43%) students completed the survey. In an effort to increase the response rate, during the Spring 2016 semester, a paper survey was distributed in class near the end of the semester in two course section. A total of 31 of the 42 (74%) of enrolled students completed the survey. Students' response scores are shown in Table 1.

6. DISCUSSION

Overall, student responses for all questions show a positive impact. On the topic of privacy, 92 % of the students reported being more aware of how data about them is being collected. In addition to being aware of data collection, 91 % of students reported being more aware of how their personal data was being used. Given the widespread collection of data in our society, this shows the course is affecting student's daily lives. Looking at action on privacy concerns, 57 % of students reported making an effort to reduce the amount of data they voluntarily share. The lower result here is not surprising since increasing one's awareness is an individual activity while taking action requires changing how you interact with another person or organization. Additionally, students may have had limited opportunity to take action since that may only be possible when signing up for a new web site or store loyalty program. This could explain the 28 % of students who were neutral on the question of taking action on privacy concerns.

Results on questions about intellectual property were comparable, with 89 % of students being more aware of the intellectual property they are producing and 82 % being more aware of the intellectual property that they use. Similar to privacy, a lower number, 68 %, reported taking action to learn more about the intellectual property they use. More students reported taking action with respect to intellectual property than privacy, possibly because they had more opportunities to act.

Similar results were seen for awareness of the broad impact technology has on society, with 91 % of students reporting increased awareness. Looking at the specific impact that technology has on the individual and their interactions with others, 91 % of students reported increased awareness.

For the question of prior knowledge of the ethical theories used in the course, 68% of students reported no prior knowledge of the theories. A majority (68 %) of students reported using the ethical theories used in the class in their daily life. This is a good indicator that students are applying material outside of the course.

7. CONCLUSION AND FUTURE PLANS

The results of this assessment survey reinforce the author's observation that this course is having an effect on students in their lives beyond the classroom. The main impact is increasing students' awareness of how technology is affecting their privacy, their creation and use of intellectual property, and society as a whole. In addition, a smaller number of students report taking action to protect their privacy and consider licensing of the intellectual property that they use. How students use the knowledge acquired in technical courses can be clearly observed as they use these skills in other courses, capstone projects, and future careers, so it is encouraging to see a similar impact from the technology ethics course.

Based on this initial trial, future plans include reviewing and possibly revising the survey questions and administering the survey to future sections of the course. In addition, since this initial work has shown positive results, ideas for following up with students to assess the impact of the course over a longer time frame are being considered. Other plans including continuing to review the course material to look for additional ideas that students might find useful in responding to ethical concerns they identify in how technology is affecting them as individuals.

While it is not possible to directly attribute the measured student responses to the revised course discussion activities, students have reacted positively to these activities in class so there is value is continuing this effort. The results presented here are encouraging, but more work is needed to develop a rigorous approach for assessing technology ethics courses.

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Appendix 1

Table 1. Questions and student response scores for end of semester survey.

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No Response
I am more aware of how companies and web sites collect data about me.	47 %	45 %	2 %	4%	2 %	0 %
I am more aware of how companies and web sites use the data they have collected on me.	40 %	51 %	2 %	6 %	2 %	0 %
I have taken action to reduce the amount of data that I voluntarily provide to companies and web sites.	21 %	36 %	28 %	11 %	4 %	0 %
I am more aware of the intellectual property that I am producing.	42 %	47 %	6 %	0 %	4 %	2 %
I am more aware of the intellectual property that I use.	42 %	40 %	13 %	2 %	2 %	2 %
I have taken action to learn more about the licensing of intellectual property that I use.	30 %	38 %	15 %	11 %	4 %	2 %
I am more aware of the impact that technology has on our society and culture	57 %	34 %	2 %	4 %	2 %	2 %
I think more about how the technology I use affects me and my interactions with others	49 %	42 %	6 %	2 %	2 %	0 %
I find the ethical theories used in this course help me evaluate situations I encounter in my daily life	34 %	34 %	17 %	11 %	4 %	0 %