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# Ethics: Who should teach it? How? What? Why?

Jill Gerhardt  
jill.gerhardt@stockton.edu  
Computer Science and Information Systems  
Stockton College  
Galloway, New Jersey 08205, USA

## Abstract

Almost everyone involved in computing education believes that it is important to teach ethics in our classes. There is some discussion however when it comes to who should teach it, how it should be taught and what should be taught. And although almost everyone believes ethics should be taught, their reasons for teaching it varies. This article will summarize the who, how, what, and why of teaching ethics. Then the author describes her own experience embedding an understanding (i.e. awareness and reasoning) of ethical issues and responsibilities into her Advanced Systems Analysis Class. The who, how, what and why is described along with a description of the assessment of the study.

**Keywords:** ethics, assessment, social issues, case studies

## 1. INTRODUCTION

There is a great deal of agreement among computer educators that students should be taught social issues including the topic of ethics. "As information technology faculty, we need to teach both the core theories and the applied practice" Homkes and Strikwerda (2011). Fuller, Little, Keim, Riedesel, Fitch & White (2009) state that "there is a strong consensus that faculty have a professional responsibility to impart professional attitudes ..." Impagliazzo (2012) wrote "Computing professionalism and ethics ... broadens students outlook on the social implications of computing."

According to Goldweber, Davoli, Little, Riedesel, Walker, Cross, & Von Kinsky's (2010) survey, only a few schools (5 % of his study) do not cover social, ethical, and/or professional issues. Homkes and Strikwerda (2009) concluded that all of the ABET accredited undergraduate programs in computer science, information systems and information technology included professional and legal issues in their curriculum.

### Who?

Since there is strong agreement that ethical issues should be taught to our computer majors and it is also an ABET requirement, the next question is WHO should teach our majors ethics? There appears to be much agreement in that area also. Goldweber's (2010) study determined that 85% of the respondents in his study think that the computing faculty should teach social issues.

### How?

However, there does not seem to be a consensus when it comes to HOW social issues should be covered in the curriculum. Should there be one separate course covering social and professional topics? Or should those topics be disbursed in many different courses? Narayanan and Vallor (2014) discussed how to teach software engineering ethics. Given the choice between a separate ethics course and including ethics in every course, they suggested that the second choice might be more immediately useful. In Goldweber's (2010) study, more schools reported a mix of standalone courses and topics embedded in other courses than

schools that used one technique by itself. If one elects to have a standalone course, then the question is when you should have it. Should it be a lower-level course or a senior course? Both choices have yin and yang.

### **What?**

The next question is WHAT should they learn about ethics? "Students need to learn how to reason about and apply ethical principles by being confronted with ethical problems in a variety of domains" (Martin, 2011). Narayanan (2014) recommend using hypotheticals and case studies. They go on to say that it is not important that students get the right answer but that they become more comfortable in dealing with ethical situations.

Many authors (Martin, 2011), (Fuller, 2009), (Goldweber, 2010), (Homkes, 2011) recommend discussing a code of ethics in our classes. Impagliazzo (2012) mentions discussing the "Ten Commandments of the Computer Ethics Institute."

Connolly (2011) argues what students should not learn about ethics. He said it should not revolve around the social impacts of computing and the ethical evaluation of those impacts. Instead he says we should "emphasize the social context aspects of the Social and Professional Issues knowledge area." For example, we should "communicate how rarely technologies achieve their exact promise..."

### **Why?**

There are multiple reasons for teaching ethics to our students. "Explicit teaching and assessment of professional values and behaviors ... may create better work outcomes for more graduates," (Fuller, 2009). According to Impagliazzo (2012), ethical material will make your course "more uplifting, more informative, and more relevant to today's world." It has the potential to attract more students and improve retention rates as they see a societal impact (Goldweber, 2010).

Women in particular appreciate courses that are relevant and have a societal impact (Gerhardt and Trail, 2008). Many studies have indicated that females prefer real-world applications as opposed to abstract ideas. Barker, McDowell, and Kalahar (2009) pointed out that concepts presented in pleasing contexts, related to a student's interest is a positive force for female retention. It is important for females that we

make computers relevant to society and their own lives as opposed to studying computers in isolation which males are more likely to prefer (Treu & Skinner, 2002).

It is vital to women that assignments have social relevance (Barker, McDowell, & Kalahar, 2009). Females want to help themselves, help society, and help the world. By including ethics and other social issues in our courses we will help them to make a personal connection to the subject matter and therefore increase their interest and retention (Gerhardt, 2011).

## **2. BACKGROUND**

In the spring of 2011, Stockton's Provost challenged the faculty and staff to define ten essential learning outcomes (ELOs) that each Stockton student should achieve by graduation. The Provost wrote, "These outcomes will combine a robust and flexible liberal arts education with adaptive marketable skills." These ELOs were not meant to be specific for a particular program, but meant to encompass all programs. The ten ELOs are: Adapting to Change, Communication Skills, Creativity and Innovation, Critical Thinking, Ethical Reasoning, Global Awareness, Information Literacy and Research Skills, Program Competence, Quantitative Reasoning, and Teamwork.

Because I had been teaching Ethics for a long time (Gerhardt, 2001), I decided to serve as a Member of Stockton's Essential Learning Objectives Ethics Committee: fall 2011 until spring 2013. The result of that committee's work is the Ethical Reasoning Learning Map-June 2013 found in Appendix-A.

Concurrently, Stockton's CSIS Program is working toward accreditation. ABET, an accreditation board for the computing major has nine Learning Outcomes for the CSIS major. Letter e is: An understanding of professional, ethical, legal, security and social issues and responsibilities. In particular, I wanted to concentrate on an understanding of ethical issues and responsibilities.

In the past (Gerhardt, 2001) I was concerned more with ethical awareness and the student's attitude concerning ethics rather than ethical reasoning. I wanted students to be able to recognize a situation as having an ethical dimension, explain why it is a dilemma, and identify those most immediately affected. These

are all listed under Level 1 on Stockton's Ethical Reasoning Learning Map.

The goal in my 2001 research was to measure the impact of including ethical issues in my classes. I wanted to measure how their awareness of ethical issues and their attitude concerning ethics changed over the progression of the class. I gave 42 Systems Analysis students two questionnaires on the first and last day of class. I computed the statistic, "rate of change" for each question {i.e. (last day-first day)/first day}.

In the first questionnaire, which was developed in Madrid, Spain by Porfirio Barroso the students were asked to rate the importance that they gave to various topics. The results had many positive changes which indicated that the importance of the topics to the students increased from the first day of the course until the last day. Some results of that study:

- Professional Integrity=3% increase
- Duty to rectify, correct errors=8% increase
- The information professional should only employ just and honest means=10% increase
- Obligation to fulfill the ethical-professional code=24% increase

The second questionnaire, which the author developed, asked to what extent the students agreed with given statements. If the rate of change increased from the first class to the last class that meant they felt stronger agreement about the statement at the end of the course which was the goal of the author. A sample of those results follows:

- I have a good understanding of what is meant by the term ethics=10% increase
- I know how to judge what is ethical=8% increase
- I have thought a great deal about computer ethics=22% increase
- I have a good understanding concerning computer ethics=29% increase
- It is important to teach computer ethics to computer professionals=11%

The author was very satisfied with those results back in 2001 and continued to use those questionnaires for several years with good feedback. I wanted the students to be aware that ethical issues would occur in their professional lives and I wanted to prepare them for those situations. Those goals are still valuable today and the questionnaires that I used then can still give informative feedback today. However, in the present study I wanted to go further.

### 3. STUDY

In my most recent study (Spring 2014), my goal was to help students make a decision based on ethical reasoning. This is Level 2 on the Stockton Learning Map. This is also what many authors suggested such as Martin (2011). She recommended using case studies or complex ethical scenarios for practicing ethical reasoning.

I decided to do this because our students will find themselves in ethical dilemmas in the real world and I wanted to help prepare them. Also, I knew that it would make the course more interesting for the students and me. Finally I knew it would help the students make a personal connection to the subject matter and therefore increase their motivation.

I embedded an understanding (i.e. awareness and reasoning) of ethical issues and responsibilities into my Advanced Systems Analysis Class in spring 2014. There was no philosophy or theology pre-requisite for the course although they might have had one. Situations with ethical ramifications were discussed and the ACM Code of Ethics was reviewed.

Stockton's Ethical Reasoning Learning Map was applied to the assessment of ABET's Student Outcome letter e: an understanding of ethical issues and responsibilities.

The performance indicator was: Students will recognize and evaluate ethical issues involved in a professional setting.

The ethical issues came from Stockton's Ethical Reasoning Learning Map:

- Identify those people most immediately affected.
- Explain how those involved will be affected.

- Identify more than one course of action.
- Identify values and principles that apply.
- Explain the reasons for the decision made.

### Subjective Data

Three scenarios were developed that contained the five ethical issues listed above. Please see Appendix-B. The students were to read the scenarios and discuss the ethical issues in the scenarios. A rubric was used to evaluate the students' response. Please see Appendix-C. Students were given the following points for their response for each issue:

- Unsatisfactory=1
- Developing=2
- Satisfactory=3
- Exemplary=4

Therefore if they scored Exemplary (4) for every one of the five dimensions, their total score per scenario would be 20 points. The goal of the study was that 70% of the students would achieve at least a Satisfactory (3) score.

### Objective Data

Several true and false questions were part of the assessment. The line between ethical and legal is often blurred depending on the observer. If we want our professionals to be ethical and accomplish ethical reasoning, knowing what is legal can be helpful. The following questions were assessed:

- 1) Electronic surveillance is illegal in the workplace. T/F
- 2) Lifting software from a commercial software package is a violation of law. T/F
- 3) There is no Code of Ethics for computer professionals. T/F
- 4) Computer professionals have professional responsibilities such as the obligation to honor contracts, agreements, and assigned responsibilities. T/F
- 5) The Ivory Snow theory is a wonderful theory. T/F

The answers are: 1) f, 2) t, 3) f, 4) t, 5) f. The goal of this study was that 70% of the students would get those questions correct. Note: The Ivory Snow theory states to not even try to be 100% correct in your work. (Epstein, 1996)

## 4. RESULTS

### Subjective Data

#### Scenario 1-

22 % of the students scored Developing, 61% of the students scored Satisfactory, and 17% of the students scored Exemplary. Therefore, 78% scored at least Satisfactory.

#### Scenario 2-

22 % of the students scored Developing, 72% of the students scored Satisfactory, and 6% of the students scored Exemplary. Therefore, 78% scored at least Satisfactory.

#### Scenario 3-

0 % of the students scored Developing, 78% of the students scored Satisfactory, and 22% of the students scored Exemplary. Therefore, 100% scored at least Satisfactory.

If the scores of the three scenarios are averaged, 85% of the students scored Satisfactory or better.

### Objective Data

Percent of students who got each question correct:

- 1) Electronic surveillance is illegal in the workplace. 83%
- 2) Lifting software from a commercial software package is a violation of law. 100%
- 3) There is no Code of Ethics for computer professionals. 100%
- 4) Computer professionals have professional responsibilities such as the obligation to honor contracts, agreements, and assigned responsibilities. 100%
- 5) The Ivory Snow theory is a wonderful theory. 100%

## 5. CONCLUSION

Without a lot of difficulty, an understanding of ethical issues and responsibilities was imbedded into my Advanced Systems Analysis Class. In fact the topic led to lively discussion and great interest on the part of the students.

The difficult part of the experience was in evaluating the subjective data. In the future I would create a more structured answer sheet where the response area for the five individual issues is clearly labeled. In spite of the challenge in assessing the subjective data, the

responses were clearly Satisfactory. The goal was that 70% of the students would score Satisfactory, and the result is that 85% scored Satisfactory.

The results for the objective data were also good with an average correct response rate of 97%. The goal of this study was that 70% of the students would get those questions correct. In the future I would suggest additional objective questions concerning the ACM Code of Ethics and a larger study possibly across the computing curriculum.

## 6. CHKNOWLEDGEMENTS

This material is based upon work supported by the National Science Foundation under Grant No. 1059934.

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## Appendix A

### Ethical Reasoning



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<p>Ethical Reasoning is the recognition of an ethical dimension in a situation, that leads to critical examination of the potential consequences of your (in)actions based on consideration of alternate viewpoints and multiple principles and their implications.</p> <p>You will be able to demonstrate ethical reasoning when faced with moral dilemmas in a variety of real-world contexts.</p>	<p><b><u>Level 1</u></b> <b>Aware</b></p> <p>You will recognize an ethical dilemma and understand your role in it.</p> <p><b>While you are a Stockton student, you will learn and be asked to demonstrate your ability to:</b></p>	<p><b><u>Level 2</u></b> <b>Competent</b></p> <p>You will reach a decision based on ethical reasoning.</p> <p><b>In addition, you will have a chance to learn and to demonstrate your ability to:</b></p>	<p><b><u>Level 3</u></b> <b>Skilled</b></p> <p>You will explain how you reached a decision and why you deemed it a better choice than alternatives.</p> <p><b>Finally, you will be able to expand your ethical reasoning skills to include the ability to:</b></p>
	1.1 Recognize a situation as having an ethical dimension.	2.1 Have all of the skills mentioned under "Aware."	3.1 Have all of the skills mentioned under "Aware" and "Competent."
	1.2 Explain why it is a dilemma.	2.2 Identify multiple courses of action.	3.2 Explain the reasoning that led to your decision.
	1.3 Identify those most immediately affected.	2.3 Identify values and principles that apply.	3.3 Explain why the solution was selected instead of alternatives.
		2.4 Identify those who are indirectly affected.	3.4 Anticipate and respond to objections to your reasoning.
		2.5 Explain how those involved will be affected.	3.5 Possess the ability to transfer the above skills to multiple areas such as personal, professional, and societal.
		2.6 Give reasons for the decision made.	

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## Appendix B

Spring 2014

Dr. Gerhardt

### Final Exam

#### Directions:

Think before you begin writing. Be short and specific. Identify those people most immediately affected in the scenario. Explain how those involved will be affected. Identify more than one course of action. Identify values and principles that apply. What do you think should be done? Explain the reasons for the decision made.

#### Question 1

Ryan is on the field, working on an IT project for the ABC Company. Ryan's boss Jordan had worked in this project but now is in a different project. Jordan likes Sage, the social media manager of ABC. Ryan is one of Sage's Facebook "friends" so he has access to her Facebook photos and other posts and information. Ryan is considering giving Sage's account information to Jordan. What should Ryan do?

#### Question 2

TechGenius Inc. has just implemented an e-commerce website for a retail merchant. It incorporates some cutting edge features such as augmented reality. Robin, a key member of the team who contributed a great deal to this project, is considering writing a blog or Facebook post that introduces the website and sharing the experience with others. What should Robin do?

#### Question 3

Sam's boss says that the new model of the car that is about to be sold has a software problem concerning the ignition. The car can accidentally change from the ignition being off to on which would immediately stop the power brakes and power steering. However, there is no time to make changes. It would cost the company too much money. And people would lose jobs. Also, they do not want the bad publicity. So they are going to sell the car as is, even though it may cause some deaths. What should Sam do?

## Appendix C

### CSIS ELO Ethical Reasoning Assessment

Spring 2014

**ABET Student Outcome CSIS.e:** An understanding of professional, ethical, legal, security and social issues and responsibilities.

**Performance Indicator CSIS.e.1:** Students will recognize and evaluate ethical issues involved in a professional setting.

**The ethical issues are:**

- Identify those people most immediately affected.
- Explain how those involved will be affected.
- Identify more than one course of action.
- Identify values and principles that apply.
- Explain the reasons for the decision made.

**Rubric:**

<p><b>Unsatisfactory (1)</b></p> <p>None are identified                  How they are affected is not explained                  No course of action                  No values and principles                  No reasons for the decision made</p>	<p><b>Developing (2)</b></p> <p>Some are identified                  How some are affected is explained                  1 vague course of action                  Inadequate values and principles                  Inadequate reasons for the decision made</p>
<p><b>Satisfactory (3)</b></p> <p>The majority are identified                  How the majority are affected is explained                  1 clear course of action                  Adequate values and principles                  Adequate reasons for the decision made</p>	<p><b>Exemplary (4)</b></p> <p>All are identified                  How all are affected is explained                  More than 1 clear course of action                  Thorough list of values and principles                  Thorough reasons for the decision made</p>