

Augmenting the Computing Ethics Course

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Abstract

I describe the evolution of my computing ethics course over a fifteen year period. I itemize and justify my rationales for the resources I have added to supplement a standard computing ethics textbook to meet and exceed the ACM curricula recommendations for a computing ethics course. I argue for prioritizing a substantial teaching focus on the nascent discipline of behavioral ethics.

1 Introduction

With a few exceptions, I have been teaching our computing ethics course (CSCI 332) at St. Cloud State University annually for the last decade and a half. The students are upper-division undergraduates. In this time, my teaching of this course has evolved. I will now describe the evolution of this course and my motivations.

My first year, as most of us do for a new prep, I began with textbook search. I settled on and adopted Baase [7] (in a previous edition). Baase targets students in computing majors, so students are more engaged with the content. I've been very happy with Baase, and I have adopted all subsequent editions to the present. Baase covers the all of the *ACM Computer Science Curricula 2013*[13] knowledge units for a computing ethics (Social Issues and Professional Practice) course except for computing history. So, I was obligated to cover computing history separately.

I maintain a Web page for this course which I stock with hyper-links to supplementary and reference materials for the topics I cover in this course. Over the years, the number of hyper-links has increased, and some of the older ones have had to be delivered via the Wayback Machine Website [48].

2 Supplements

Baase's textbook demonstrates good scholarship with extensive footnotes, bibliographic citations, and an index. Similarly, each of the following books, which I use as a whole or excerpt, demonstrate equivalent good scholarship. I emphasize to my students that some essential information is delivered via footnote in each.

2.1 Computing History

I start covering computing history by adopting a history of computing book by Ifrah [12]. Ifrah begins with a history of mathematics necessary for modern computing, then details the evolution of other necessary areas including the theories of mechanics, electricity, and logic. He cites numerous examples of these knowledge areas evolving through a hierarchical process of going from specific instances to generalizations, including their notational systems. When Ifrah discusses the evolution of notational systems, I show some research reports supporting the Sapir-Whorf hypothesis [36] which asserts that language influences cognition. I don't recommend using all of Ifrah, select and excerpt what you need. I supplement Ifrah with a set of Web pages covering the history of computing as a whole and additional Web pages for specifics. One good Web page that offers chronological as well as contextual developments is the Computer History Museum's Timeline of Computing History.[4] (This is also a good resource for lower-level students) I use the additional references to identify specific products or developments which represent specific examples where novel and superior technologies were revolutionary. However, I also identify others which failed to influence future technologies or failed in the marketplace, as well as those which were otherwise unremarkable, but were nonetheless profoundly influential in some respect (e.g. the introduction of the IBM PC). I discuss these examples

in class with inferences as to why these products and developments failed or succeeded (sometimes both, e.g. Visicalc). I strongly believe that students need a good exposure to how we got to today to help them prepare for tomorrow.

2.2 Open Source

I observed that the open source model of software development was profoundly influencing many of the knowledge units of the ACM ethics course recommendations. So, I explicitly integrated a discussion of open source into these knowledge units. I documented this process in my exposition, *Viewing Computing Ethics through an Open Source Lens*. [6]

2.3 Minding the Machines

I adopted Evan & Manion's *Minding the Machines* [11] because it describes, with numerous case studies, observations of how essential social factors are in the development and maintenance of complicated technical systems, especially where subsystems cannot be more loosely coupled. The authors recommend the establishment of more robust communication networks between stakeholders and other enhancements to conventional development and maintenance processes. This book includes discussions of risk assessment, stakeholders, theories of the causes of failures and disasters, responsibilities (of engineers and scientists, management, and the legal system with public policy), and the value of civic action.

2.4 Infotopia

Cass Sunstein is a legal scholar who's research interest is in how juries arrive at decisions. In investigating this issue, his research revealed numerous factors which could influence the jury process. He was trying to discover and explain why the deliberation process in the jury room could be influenced by biasing factors, especially with respect to information aggregation, despite the jury members' seemingly best efforts. Sunstein broadened the scope of his investigations to examine deliberating groups in general. He further broadened his scope to include a comparison of the process of deliberation with other processes for information discovery and decision-making: experts, surveys, Delphi techniques, open source, wikis, democratic processes, markets, and prediction markets. These comparisons include contexts where each process is relatively successful or unsuccessful. Sunstein synthesized these ideas into his book, *Infotopia* [18] which I subsequently adopted. One of the primary tools Sunstein offers for analyzing deliberation is the Condorcet Jury Theorem (controlled by the same Poisson equation that computing students use in studying hashing). Also of note, for computing students, are the examples where businesses developing software have used internal prediction markets as a software engineering aid to better estimate delivery dates, defect counts, and other deliverable measures.

2.5 *The Origins of Virtue*

I adopted Ridley's *The Origins of Virtue: Human Instincts and the Evolution of Cooperation* [17] to enhance student acceptance of the behaviors, processes, and advice for professionals in computing advocated in a computing ethics course. SCSU resides in state and federal voting districts which have consistently voted for politically conservative candidates since I began teaching at SCSU. My intention has been for this book to serve as a counterpoint to some of the cultural attitudes eschewing social cooperation that the students may have been exposed to (e.g. social Darwinism). Ridley explains that our success as a species (so far) is due to our evolved instincts and cultural support for cooperation. Our species has arguably evolved to act as the most cooperative species (sometimes termed hyper-cooperative) giving our species ultimately the best competitive advantage. Ridley describes different manifestations of cooperation in other species, from unicellular to human. Two chapters are devoted to discussion of strategies for playing prisoners' dilemma games [43], from single round through iterated, via computer simulation. Ridley then shows multiple manifestations of the prisoner's dilemma in nature, in each case with lifeforms evolving behaviors to maximize their chances of winning in an iterated context. Ridley covers issues involving commons vs. ownership, state regulation vs. self-regulation, the benefits of groupishness vs. the problems with tribalism, the benefits of trade, the benefits of trust as a form of social capital, emotions and decision-making, reciprocity and fairness, and the lack in humans of an innate instinct for ecology. Ridley's discussions of trust and the growth of reputation capital by providing public goods can contribute to explaining the value of maintaining open source projects - corroborating Raymond's assertions in his series of essays comprising his book, *The Cathedral and the Bazaar* [46], which explain how and why open source proves effective and sustainable.

3 Behavioral Ethics

Ridley's book describes the problems classical economic models have had by operating under the constraints of *rational choice theory* [44] where individuals in an economic system are assumed to be informed and act rationally on that information in conjunction with their preferences. We know, though an increasing body of knowledge in cognitive psychology, that human rationality is plastic and incomplete, subject to internal and external influences, some we are aware of, but many operate unconsciously. More recent economic models have begun to replace assumptions of rational choice theory with those of *bounded rationality* [25], and more generally with behavioral economics [22].

Just as with classical economic models, Baase states that [7, p. 26] "Ethical theory assumes that people are rational and make free choices." However, Baase qualifies that statement stating "Neither of these conditions is always and absolutely true." But, Baase doesn't describe how we tend to be irrational and constrained in our freedoms of choice. Both Ridley's and Sunstein's books describe many cognitive psychological factors which have been shown to influence our decision making. Specific studies include the Asch conformity experiments [21], the Milgram experiment [40] on submission to authority figures, (I add the Stanford prison experiment [45] which examined the power of assumed

societal roles.), and Wason selection tasks [47, 5, 2].

After teaching from these books, I reasoned that for our teaching of normative ethics [41] is to have the desired impact, we should qualify and temper the rationality and free will assumptions with what we have learned about the cognitive psychology of decision-making. A literature search informed me that there was a label for this focus on the cognitive psychology of ethical decision making, *behavioral ethics* [23], and that I was not the first to this realization in professional ethics pedagogy [3, 16, 9, 8, 10, 49, 1].

Michael Lewis [14], wrote a biography about the relationship between the two psychologists who brought cognitive psychology to the analysis of decision-making, Daniel Kahneman and Amos Tversky. Lewis wrote that “They hoped, they wrote, that the decisions made by experts in these fields could be ‘significantly improved by making these experts aware of their own biases, and by the development of methods to reduce and counteract the sources of bias in judgment.’ ” Robert Prentice [16] begins his article on teaching behavioral ethics by stating,

Behavioral ethics is arguably the “next big thing” in ethics teaching and research. It has become the hot new item because its research agenda has produced much knowledge about how people choose and why people act when facing ethical issues that were previously unknown. The work of Dan Ariely, Max Bazerman, Daylian Cain, David De Cremer, David DeSteno, Francesca Gino, George Loewenstein, David Messick, Lamar Pierce, Ann Tenbrunsel, Piercarlo Valdesolo, and many, many others has put ethics teachers in a position to describe more accurately than ever before the ethical decision-making processes that people tend to use—and the flaws in those processes.

Prentice concludes his article by stating, “Behavioral ethics helps to explain why good people do bad things, why people in general find it difficult to be as ethical as they would like to be.” In his footnotes, Prentice quotes Walsh: “[t]he ultimate promise of behavioral ethics is that it provides pragmatic tools that have been demonstrated to work”

This prior support shows that I am adding to a growing consensus that behavioral ethics should supplement normative ethics in professional ethics pedagogy. If we are forewarned regarding the cognitive influences on our decision-making, then we are (somewhat) forearmed.

Here some cognitive influences which can be covered:

- cognitive biases [26, 37, 24, 33, 34]
- heuristics [31]
- memes and memetics [38, 39]
- innumeracy and statistical reasoning [15, 20]
- information cascades [35]
- Dunbar’s number and the Allen curve [29, 19]
- cognitive load [28]

- implicit attitude [32]
- Principal-agent problem [42]
- dysrationalia and cognitive dissonance [30, 27]

There is now so much content now that could be presented, one might argue for a generic behavioral ethics course to be offered in conjunction with a disciplinary professional normative ethics course.

4 Conclusion

I described the evolution of my computing ethics course over a fifteen year period. I itemized and justified my rationales for the resources I added to supplement a standard computing ethics textbook to meet and exceed the ACM curricula recommendations for a computing ethics course. I argued for prioritizing a substantial teaching focus on the nascent discipline of behavioral ethics.

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