

Building Online SEE Resources: What works, where can improvements be made?

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When looking at designing online resources for science and engineering ethics (SEE), developers should consider to what extent their web sites can fulfill the often-cited five goals set by the 1980 Hastings Center Working Group for teaching ethics in higher education. Online readings, case studies, discussion forums, and tutorials should help individuals in: 1) stimulating the moral imagination, 2) recognizing ethical issues, 3) developing analytical skills, 4) eliciting a sense of moral obligation and personal responsibility, and 5) tolerating and resisting disagreement and ambiguity.¹ As we look to develop the next generation of SEE online resources, we must consider how new web design methods and technologies can be used to meet these goals.

Current SEE online resources have already met these goals in many respects, both by using the web to disseminate information through case study libraries and tutorials, and in a more limited way, by providing opportunities for discussion among experts and users of these resources. In talking with students and faculty, and from my own experience using online resources, the following attributes seem to be extremely important to ensure the usefulness of these sites:

- Perceived relevancy of information – web sites are up to date, materials are related to user's own subject area (cases specifically for mechanical engineers, etc.). Includes quality, supporting texts such as commentaries by “experts in the field.”
- Ease of navigation – users can quickly navigate through site and find relevant case studies, articles, etc.²
- Low intimidation factor – the site has a clean design, is easy to use, large blocks of text are broken up.
- Potential for feedback/connection to others – site includes way to ask questions, receive help, and participate in discussions.

¹ Callahan, Daniel and Sissela Bok. *The Teaching of Ethics in Higher Education*. (New York: Plenum Press, 1980) 300.

² For further discussion see Bailin, Alan and Aisha Peña. “Online Library Tutorials, Narratives, and Scripts.” *Journal of Academic Librarianship*. 33:1 (2007) 107.

In gathering examples for this paper, I reviewed over thirty publicly available resources dealing with professional ethics. These resources can roughly be divided into two categories: asynchronous tutorials either to be used alone or in conjunction with a face to face course, and resource centers/case libraries such as the Online Ethics Center for Engineering and Science (OECES). The following is a review of some examples of these resources, as well as a number of suggestions about how the next generation of resources might be expanded upon and improved.

Tutorials – Stand-alone and Blended Learning.

The examples of publicly available stand-alone tutorials I reviewed dealt exclusively with the responsible conduct of research (RCR), and varied in quality, navigation, and presentation. All of the tutorials I reviewed could have done more to fulfill the Hastings Center goals. They also fell short of the goals expressed by Sieber in her article, “Misconceptions and Realities about Teaching Online,” which discusses aspects of a well designed online course for teaching ethics. For example, the design of the reviewed tutorials does not allow students to engage in active ethical decision-making and analysis, and no online course provided much in the way of feedback or chances for discussion. However, a handful of these tutorials were effective as a way to convey essential information to often-busy graduate students and practitioners.³

The Collaborative Institutional Training Initiative (CITI) course in responsible research (<https://www.citiprogram.org/>) and the Columbia University RCR Tutorials (<http://ccnmtl.columbia.edu/projects/rcr/>) were the most organized and innovative of the tutorials I reviewed. These tutorials convey information in a clear and concise way and seamlessly integrate videos of case studies and commentaries by experts in the main framework of the course. All essential information is included in the text of the pages, so individuals with slow Internet connections or old computers can still use the tutorials. The design of the Columbia site also allows the user to pursue different areas of interest while still in the tutorial. Instead of designing the tutorial like a print text that only allows users to flip back and forth through the pages, this tutorial’s design allows users to explore concepts in greater depth through the effective use of links, navigation buttons, and popup windows.⁴

Overall, the Collaborative CITI Course in Responsible Research goes beyond the Columbia tutorials by offering the ability to coordinate the course with an individuals’ discipline

³ Sieber, J.E. “Misconceptions and Realities about Teaching Online” *Science and Engineering Ethics*. 11:3 (2005) 333-34.

⁴ For more information about potential site design elements for tutorials, see Bailin, 107-113.

(humanities, biological sciences, etc.) and to track the progress of a user through the course. This course, developed in 2000 at the request of the U.S. Department of Health and Human Services, allows subscribing members to include institution-specific information in their online courses, and also offer a more general course open to individuals without a university subscription.⁵

One of the main drawbacks of stand-alone tutorials is their failure to foster among students and practitioners. While the two tutorials reviewed excel at conveying information to busy individuals, they do not allow users to form the kind of “ethics community” that can happen in a face-to-face classroom or workshop.⁶ While face-to-face interactions will most likely never be duplicated in an online environment, new web technologies may offer limited opportunities for this kind of community building. One resource that attempts to accomplish this is the OpenSeminar for Research Ethics (OSRE), an NSF funded project that seeks to create an online “ethics community” both through the development of an online course, and through the creation of a social networking site that connects students, researchers, and instructors in sharing ideas and resources about RCR (<http://openseminar.org/ethics/>). Instructors involved in the project are able to design their own online ethics courses either by using modules developed by themselves or by choosing modules developed by other instructors. In the “Community” area, students and faculty are able to set up a profile to share their interests, questions, and expertise with others, and they have the chance to participate in synchronous and asynchronous discussions.

In the summers of 2007 and 2008, an NSF Research Experience for Undergraduates (REU) course that CSEP was involved in used OpenSeminar as a supplementary resource for weekly in-class sessions on RCR. Students were not required to create a profile or to use the community portion of the site, but many did use the online course to begin their research for presentations on their assigned ethics topics. The site proved to be a decent resource for the students, but suffered from a few minor drawbacks: especially a lack of consistency both in the quality of information included in the course modules and in the ways in which students were expected to navigate through each module. These flaws arose from the collaborative nature of the course. Future collaborative courses of this kind should include a clear navigational system for all modules in the course, and guidelines and a review system to ensure the quality of information submitted to the site by participating instructors. An online course that combined the clarity of design found in

⁵ For more information about this program, see Braunschweiger, Paul and Kenneth W. Goodman. “The CITI Program: An International Online Resource for Education in Human Subjects Protection and Responsible Conduct of Research.” *Academic Medicine* 82:9 (2007) 861-864.

⁶ Schrag, Brian. “Can Web-based Instruction Satisfy Appropriate Pedagogical Objectives?” *Science and Engineering Ethics*. 11:3 (2005) 363.

stand-alone tutorials with the possibilities for interaction and collaboration found in courses like OpenSeminar may prove to be an interesting improvement to asynchronous online RCR courses or tutorials.

Case Libraries/Ethics Resource Centers.

Well-designed ethics resource centers and case libraries, such as Ethics Update (<http://ethics.sandiego.edu/>) and the Online Ethics Center for Engineering and Science (OECES) (<http://www.onlineethics.org/>) provide students with a wonderful starting point for beginning their online research of SEE topics. What makes these two resources stand out from other sites is their inclusion of supportive materials, such as case commentaries and codes of ethics, and their use of web technologies to facilitate further learning, such as the Ethics Case Discussion Web Forum on the OECES site. A 2003 study by Keefer that looked at the use of online ethics cases by undergraduate students found that such material helped enrich the students' grasp of the ethical issues present in a case.⁷ These ethics resource centers and case libraries could be further enhanced by developing ways to help users quickly find relevant case studies and supporting materials, as well as by expanding the number of quality case studies available online.

Two of the main problems users of the CSEP Library encounter is the difficulty of finding a case illustrating a specific ethical issue, and the challenge of finding a new case to use for class discussion, especially in the area of engineering ethics. This first problem could be resolved by indexing cases not only by name and discipline, but also by the type of ethical issues they deal with, as in the Scension Healthcare Ethics Cases collection (<http://www.ascensionhealth.org/ethics/public/cases/main.asp>). Indeed, the OEC site has already begun doing this in its case discussion forum, and would only need to make this feature more visible from its main page. This second issue might be solved by webmasters providing a clear and easy way for SEE instructors to submit new cases to be included in the case library (a kind of drop box, where submitted cases could be reviewed for quality before being added to the site), and actively soliciting new contributions.

One other area in which many of the case libraries and ethics resources centers I reviewed could be improved, is in the utilization of new web design techniques and web technologies. The use of tabs in the Ethics Update page makes finding materials extremely easy, and the side menus in the new OECES design allows a user to very quickly locate materials by discipline and topic.

⁷ Keefer, Matthew Wilks. "Making Good Use of Online Case Study Material" *Science and Engineering Ethics* 11:3 (2005) 413-429.

In the case of many other case study libraries, these sites have not been regularly maintained, and these sites' broken links and outdated design lead to a great amount of frustration on the part of users. Along with regular maintenance, case libraries and ethics resource centers should also begin exploring ways to effectively use web technologies to engage users in active learning, either through active discussion or even allowing users to actively create site content. Blogs could be used to post the "case of the week" and elicit responses, wikis could be used to allow students to draft codes of conduct for their own laboratory groups (in the same way that individuals can contribute articles to the famous online dictionary Wikipedia), or a case library could hold a contest for the best video case study submitted by students and post the top submissions on the site.⁸ Intelligent use of these new technologies may offer users the chance to grapple with ethical questions in a variety of innovative ways, and to gain feedback from a much larger ethics community than previously available.

Resources for Instructors and Principal Investigators

With the Passage of the America Competes Act in 2007 that requires all NSF grants to include ethics training for students, the demand for ethics instruction support is likely to rise, especially from Principal Investigators of NSF-funded projects.⁹ CSEP is already beginning to develop some ways of meeting this need. We are currently working on an NSF-funded project entitled, "Ethics in the Details" which will culminate in the development of a web resource where engineering faculty will be able to submit and download problems with an ethical component for use in the classroom. We are also at the beginning stage of building an online resource to effectively present the information compiled through the "Ethics Across the Curriculum" Workshop CSEP hosted from 1997-2003. This workshop brought together faculty from different institutions and disciplines to develop ways to integrate ethics into their courses, and the online resource based on these workshops will share some of the best practices and ideas developed by workshop participants.

When reviewing materials for faculty that currently exist, the most impressive collections of resources were at the Online Ethics Center for Science and Engineering under the "On Education" section, and the Responsible Conduct of Research Education Consortium (RCREC) web site (<http://rrec.org/events.htm>). This later site, though it has not been updated for a number

⁸ See Syracuse University Research and Academic Integrity site for example.

<http://gradschpdprograms.syr.edu/resources/videos.php>

⁹ "America Competes Act of 2007. Pub. L. no. 110-69 121 Stat. 573. Section 7008 – Post-doctoral Research Fellows, Section 7009 – Responsible Conduct of Research. http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_public_laws&docid=f:publ069.110.pdf. August 9, 2007.

of years, works as a kind of clearinghouse and provides links to a wide range of information for instructors, such as tools to help facilitate ethics case discussions. One idea for better serving the needs of PI's and instructors in the future is to design a site that takes the best elements from the OECES and the RCREC courses, and develop a comprehensive site for faculty and PI's. This resource could include such components as a large library of cases and commentaries, a well-organized database of further ethics resources available or under development, a database of developed syllabi, full-text of readings, an expertise database of individuals experienced in RCR and engineering ethics instruction, or an online discussion forum for the exchange of information among instructors.

Conclusion

Along with the suggestions made in the introduction of this paper, the SEE resources reviewed could be improved in the following four areas:

- Treatment of technology as “alive” – there is a constant need to update, maintain, and add to SEE resources– relationship b/w new technologies and learning as co-evolutionary.
- Relevance & quality of resources – efforts should be made to solicit new material, and review quality of material uploaded.
- Scope – look at ways to allow users to personalize site, as done in the CITI course.
Possibly of focusing searches to materials most relevant by discipline (biology/chemistry/etc) or by role (student/instructor/PI).
- Interactivity – look at new ways to thoughtfully exploit new technologies to promote an interactive learning environment.

Developers must continue to maintain and improve the SEE web resources that have already been created, while continuing to look for new opportunities to expand the abilities of these sites. Overall, the types of online ethics resources currently available tend to put the users in a passive rather than an active role. Online tutorials, case libraries, and ethics resource centers are well adapted for introducing users to the ethical issues inherent in scientific research and engineering, and are to some extent able to meet the goals mentioned in this paper's introduction. However, new web technologies have the potential for allowing users to actively engage in ethical decision-making processes in ways that were formerly not possible in an online environment. The next generation of SEE resources should utilize these opportunities in a way that further fulfills the main goals of teaching ethics in higher education.