![The Center for Nanotechnology in Society — ARIZONA STATE UNIVERSITY]

SEI Congress Explores How to Teach Social & Ethical Implications of Research to Scientists & Engineers

In 2008, ASU faculty were awarded a $300K NSF grant to explore ways to integrate micro and macro ethics into graduate science and engineering education. At that time, a "results dissemination workshop" at the end of the study was proposed as the means by which to present the study's findings. Over time, however, as the project's researchers talked to others who wanted to work in the area of ethics education, it became clear that the lessons learned in the grant would be valuable for a much broader set of teachers.

Because the trend to educate scientists and engineers on the broader, ethical implications of their research is relatively new, there are no cohesive curricula or recognized sets of best practices. Social and ethical implications (SEI) education today occurs in a wide variety of spaces, including laboratory training sessions, science museums, online modules, study abroad experiences, and the classroom.

Therefore, in November, 2011, CNS-ASU co-sponsored the first **Congress on Teaching Social and Ethical Implications of Research** to bring together those who have already developed such approaches to share their programs, materials, assessment methods and experiences. Over 100 participants from across the U.S. attended.

CNS-ASU will continue with this project by developing macro ethics modules for inclusion in the online Responsible Conduct of Research (RCR) courses offered through the Collaborative Institutional Training Initiative (CITI).

The presentations at the congress revealed a myriad of SEI approaches, including:

- Integrating technical and social analysis with creative design education using a problem-based learning approach.

- A 3D computer "virtual world," which engages students in authentic learning activities that address issues at the intersection of science and ethics.

- Reading/Viewing dystopian science fiction (i.e., the film *Minority Report*) to engage first-year engineering students in discussing the ethical implications of engineering research and practice.

- Interdisciplinary classroom experiences that bring in guest lecturers and integrate ethical and social implications with (astrobiology) space exploration and life detection scenarios.

- Utilizing debates and communication skills training to help students explore and reflect upon the social and ethical consequences of technology.

- Online resources, such as the National Center for Professional and Research Ethics website, Ethics CORE (Collaborative Online Resource Environment, at http://nationalethicscenter.org).

- Utilizing partnership opportunities between research institutions and science museums.

- Assessment of microethics and macroethics education

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