Teaching Technology and Society

David A. Rogers

Department of Electrical and Computer Engineering
North Dakota State University
Fargo, ND 58105-5285

Abstract - The technology and society course explores the place technology has in society and the various viewpoints held concerning technology. It considers the benefits and problems technology creates. A fundamental problem is that of establishing a basis for making value judgments. A typical course includes the impact of the media, weapons and warfare, energy, the impact of human culture and government, and the reaction of the natural environment to human activity. Films or video materials can tell much of the technology and society story, from twentieth-century development of the media to the great environmental dilemmas of today. Contributions by people like Abraham Lincoln to the debate on government and the environment, and the experiences of the nations of the world, inform student thinking. Study questions sharpen student knowledge of significant facts and figures. Essay questions hone critical thinking skills. The technology and society course is a great opportunity to pursue issues critical to all of life.

Introduction

The technology and society course has been a fixture at many colleges and universities at least since the days of the Vietnam Conflict. Although this course might find a home in one of many different departments or colleges, it is not unusual for it to be a course that has had the special interest of the dean of a college of engineering. As such it might have been taught with the course prefix of General Engineering or Engineering. At some institutions the purpose might have been to involve engineering faculty in social issues that went beyond their narrow technical interests. Today this approach or concern is less likely to be the case since the course has developed a life of its own and has, today, broad acceptance in the academic world.

This generation's technology and society course explores the place technology has in society and the various viewpoints held concerning technology. A course might emphasize the benefits a certain technology brings to society, or it might emphasize the problems technology could or does create for society. A fundamental problem for either approach is that of establishing a basis for making value judgments. Commonly this is done using arguments rooted in the idea of the common good.

Course Content

The technology and society course might be taught as an approved social science course as part of the university's general education program. It provides a vehicle in which the instructor and

students analyze the behaviors and consequences of technology as viewed as a human endeavor, consider the structures and constraints created by the technological enterprise, and expose the conflicts technology creates in society. It is likely, too, that the course will be part of the international emphasis of the university because it focuses on analysis of worldwide issues illustrating the interdependence of the world and its people.

As a general education course it covers the concepts students will need to function in an international environment. It takes a positive approach to technology while noting that appropriate progress in technological development can be made by understanding the history of technology and its consequences nationally and internationally. Presentations in class and readings in the textbooks show the human impact of technology. Video presentations expand the students' horizons and awaken interest in this area. Class discussions and preparation for comprehensive tests develop student competence. The student is given opportunities to integrate knowledge and ideas in a coherent and meaningful manner through content that offers examples of the interaction between technology and the human environment. The student learns that future technological developments are tightly woven into the fabric of human involvement in this world.

Specific topics that are emphasized in class through lecture and video presentations include:

- Native Americans (First Americans) and the environment
- the wonders of the natural world
- contemporary efforts to apply engineering tools to solve urban problems
- Rachel Carson and the environment
- the history and social impact of radio and television
- total mechanized warfare in two world wars
- the atom bomb and its consequences
- Three Mile Island and Chernobyl
- mega dams for hydroelectric energy
- economic development in the Third World
- genetically modified organisms
- global climate change, and
- the entire Earth remade to meet human desires.

Students improve their abilities in integration through class discussions, active learning activities, essays, and preparation for comprehensive tests involving both objective and subjective components. To deal with the international studies component, a significant course outcome is to develop an international perspective based upon an analysis of world issues. To meet this outcome, examples of the impact of technology on society are chosen from around the world. Geographically this includes countries such as Japan, China, Brazil, and the United States. Physically this includes the state of the air, land, and water around the world.

Course Procedures

The course consists of a series of lectures, presentations, active learning activities, and discussions. Most classes include a video presentation. Grading is based on examinations, active learning activities, unannounced quizzes or exercises, class participation, and writing opportunities. Written assignments are often made spontaneously in class. These might be started or completed in class. Students are encouraged to express their opinions on class issues both orally and in writing. At NDSU, the class meets twice weekly for 75 minutes. The instructor always breaks for questions on any topic 50 minutes into the session. This has proved to be very effective since students know that this time will always be given to questions and they are not interrupting the progress of the class.

Each semester the course is offered there is usually some important government action dealing with topics of interest to the course. Students are assigned (or can do for extra credit) a short report on current legislation passed or implemented that will change government action in the areas of the environment, energy, the media, or defense. Extra credit can also be earned through an approved community volunteer student activity.

Some typical student writing projects are: (a) submit the day's lecture notes, (b) write a personal statement of values, (c) write a personal statement of convictions regarding the environment, or (d) write a summary of a recent course-related article that appears in a magazine such as *Scientific American* or *National Geographic*.

Students are assigned readings in textbooks by Barbour(1993), Volti (2005), and Brown (2001). They are encouraged, optionally, to develop a reading journal that contains their personal notes and outlines of all the textbook readings. It follows their twice-weekly reading assignments, reporting important people, events, dates, concepts, etc., mentioned in the textbooks. The reading journal helps students who work hard in the course, but don't see this resulting in the grade they desire. In practice, usually only the most highly motivated students submit a journal.

Video Materials

Films or video materials (Rogers, 1997) can tell much of the technology and society story, from the development of the media in the 20th century (for example, *Picture Power* from the People's Century series) to the great environmental dilemmas of today (for example, Al Gore's *An Inconvenient Truth*). The Internet itself is a host to a broad spectrum of materials (for example, "Tick" from Environmental Defense). The challenge to the instructor is to select the best materials from the immense variety available today.

Sample Lecture Content

Appealing to Abraham Lincoln (1838) enriches the debate on the environment in the context of discussion of provision for the common good of society. In his Lyceum speech he states his conviction that Americans have the responsibility to transmit what they have been given to all future generations. Lincoln was speaking early in his career on the perpetuation of American political institutions. In the opening of a very serious speech that through its publication helped

to awaken a broad interest in Lincoln the politician, Lincoln proclaims two responsibilities of every American citizen. The first is the responsibility to deliver the "American" portion of the earth to all future generations. The second is the responsibility of delivering unspoiled to all future generations the American political system. Class discussion can follow that deals with the relationship of Lincoln's thought to the issues of environmental impact and the common good.

Examinations

Over one thousand study questions challenge the students to sharpen their knowledge of significant facts and figures. This pool is divided into three sections that correspond to the three major exams given during the semester. Each section contains about 400 questions. Some 30 to 40 new questions are added to the pool each semester. As the course develops, some questions are discarded. New questions are based on material presented in class and on the readings in the textbooks. Each examination includes at least one essay question. Student performance on the objective portion the of exams is typically fairly uniform over the range of about 45% to 95%. Essay performance is usually excellent with the exception of a typical 15% to 20% who don't respond to the question. This results in student percentage grades that range from about 50 to the low 90's. Students rarely dispute the assigned letter grades.

Assessment

The course has been assessed from the perspective of student acquisition of knowledge and from the perspective of student satisfaction with the course and teacher. Student performance is usually high if the assessment item comes from at least two of three sources: lecture and class activities, readings in the textbook, or the question pool. Student satisfaction surveys often bring comments from a small number of students indicating that they would prefer essay testing only. However, the majority of students indicate that they don't wish to see the testing method changed. Anecdotal evidence suggests that many students would prefer taking a course that had a stronger perceived link to their vocational interests. A few students say that the course has had a profound impact on their thinking.

Conclusion

The technology and society course explores various viewpoints held concerning technology. It emphasizes the problems technology creates for society. Study of the media, weapons and warfare, energy, the impact of human culture and government, and the contemporary environmental debate introduce the student to the dilemmas common to this century.

References

Barbour, I. G. (1993). *Ethics in an Age of Technology*. San Francisco: Harper.

Brown, L. R. (2001). *Eco-Economy.* New York: W. W. Norton.

Lincoln, A. (1838). Lyceum Address. In Basler, R. P. (Ed.), *The Collected Works of Abraham Lincoln.* Retrieved June 4, 2007 from

http://showcase.netins.net/web/creative/lincoln/speeches/lyceum.htm. Also cited in Rogers, D. A., "Ethics in the Impact of Technology on Society Course." *Proceedings, 2005 ASEE North Midwest Regional Conference* (pp. 65-72). Brookings, SD.

Rogers, D. A. (1997). "Video Resources for Technology and Society." *Proceedings, 1997 ASEE/IEEE Frontiers in Education Conference* (Session F4G, 6 pp.). Pittsburgh, PA.

Volti, R. (2005). *Society and Technological Change*. New York: Worth.

Biographical Information

DAVID A. ROGERS is a Professor of Electrical and Computer Engineering at NDSU. He received the B.S.E.E. degree from the University of Washington, the M.S.E.E. from Illinois Institute of Technology, and the Ph.D. (E.E.) from Washington. He earned the Master of Divinity degree in Ministry from Trinity Evangelical Divinity School.