

**Are We Losing Our Minds (2470)
Paper 1211**

**A Course in Difference, Power, and Discrimination
For Engineering Students**

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Abstract

Oregon State University has adopted as a general education requirement that all students must take a designated difference, power and discrimination (DPD) course. The DPD requirement was created by the faculty to assist students in their education related to the unequal distribution of social, economic, and political power in the United States and in other countries. The DPD requirement engages students in the intellectual examination of the structures, systems, and ideologies that sustain discrimination, and the unequal distribution of power and resources in society. For the 2002 academic year, an effort was initiated to expand the DPD courses into all OSU colleges including the College of Engineering (COE). This paper describes a course for the COE that is directed towards meeting the needs of engineering students to understand issues related to diversity, power, and discrimination. We describe the learning objectives for the course, the organization including learning cycles, the specific activities chosen to seek maximum involvement and reflection by the students, selected readings, and assessment techniques that will be used to determine the effectiveness of meeting the learning objectives.

Introduction

Like many predominantly white higher education institutions, Oregon State University faces significant challenges in diversifying the faculty and student population, as well as providing students with compelling learning experiences around issues of diversity and difference. In what might be called a common scenario across campuses in the U.S., the decision at OSU to include courses on difference, power, and discrimination in the core curriculum had its origins in student unrest and demands for a more welcoming campus climate for students of color. While many universities have chosen to require a course in multiculturalism in their core curriculum, Oregon State University's response was to create a program - - the Difference, Power and Discrimination (DPD) program. Established in 1990, DPD combines an academic requirement for students with a course development opportunity for faculty, with the goal of creating a more inclusive curriculum that addresses issues of race, class, gender, sexual orientation, and other

institutionalized systems of inequality. DPD provides faculty and staff with the training and resources needed to develop or modify comparative diversity courses.

The academic requirement is based on the idea that the unequal distribution of social, economic, and political power in the U.S. and other countries is sustained through a variety of individual beliefs and institutional practices that have tended to obscure the origins and operations of social discrimination such that these beliefs and practices are often viewed as the natural order. The DPD requirement engages students in the intellectual examination of the complexity of the structures, systems, and ideologies that sustain discrimination, and the unequal distribution of power and resources in society. Such examination is believed to enhance meaningful democratic participation in our increasingly multicultural society.

At Oregon State University, all students are required to take a certified DPD course as part of their “baccalaureate core.” DPD courses are approved by the Baccalaureate Core Committee of the Faculty Senate based upon the following criteria:

1. be at least three credits;
2. emphasize elements of critical thinking;
3. have as their central focus the study of the unequal distribution of power within the framework of particular disciplines and course content;
4. focus primarily on the United States, although global contexts are encouraged;
5. provide illustrations of ways in which structural, institutional, and ideological discrimination arise from socially defined meanings attributed to difference;
6. provide historical and contemporary examples of difference, power, and discrimination across cultural, economic, social, and political institutions in the United States;
7. provide illustrations of ways in which the interactions of social categories, such as race, ethnicity, social class, gender, religion, sexual orientation, disability, and age, are related to difference, power, and discrimination in the United States;
8. provide a multidisciplinary perspective on issues of difference, power, and discrimination;
9. incorporate interactive learning activities (e.g., ungraded, in-class writing exercise; classroom discussion; peer-review of written material; web-based discussion group); and
10. be regularly numbered departmental offerings rather than x99 or blanket number courses.

From its inception, a key part of DPD was the notion that development of courses to meet the DPD requirement would take place across campus, in every major discipline. This continues to be a significant challenge to the success of the program. Of the 44 courses developed in the last nine years, 38 have been developed by faculty in the College of Liberal Arts. Importantly, DPD courses are offered in the colleges of Agricultural Sciences, Home Economics and Education, and Science also. For the 2002 academic year, OSU has initiated an effort to expand the DPD course offerings to other colleges.

A major strength of the DPD program, and one that may make it possible to expand DPD course offerings across disciplines, is recognition that many faculty at the University

would benefit from an opportunity to explore and create ways to address issues of difference, power, and discrimination in their courses. Many faculty, themselves, were not exposed to these issues in their own training; many have had relatively little experience managing issues of diversity in the classroom.

The DPD Faculty Development Seminar is offered twice a year. It is open to all faculty who are interested in developing a DPD course. Faculty are paid a stipend to participate in the seminar; the funds can be used for any professional development activities that interest individual faculty members.

The DPD Director facilitates analysis and discussion in an advanced seminar format. Participants meet once a week, usually for several hours, over an 8-10 week period. The seminar focuses on reading and discussing a large variety of materials that cover topics such as: history and current forms of discrimination, history of the multicultural U.S., developing multicultural awareness, multicultural teaching in the university, and creative learning strategies for the multicultural classroom.

The Role of the DPD Program in Educating Engineers

DPD courses focus on providing students with the knowledge, understanding, and sensitivity to work and live in a diverse society. While many of our institutions, organizations, and neighborhoods remain largely segregated, particularly by race/ethnicity, the overall trend toward greater diversity is well documented¹. Engineering is one field that lacks the gender and ethnic diversity reflected in other fields such as biology, medicine, and law. This lack of diversity was recently noted by former President Clinton, resulting in the establishment of a national mentoring award for persons bringing under-represented students into engineering². In addition, former President Clinton directed the National Science and Technology Council (NSTC) to develop recommendations on how to achieve greater diversity in our technical workforce.

Firms that hire our graduating engineers are demanding both a greater number of graduates from under-represented groups and greater diversity awareness and skill by all students. These firms or entities clearly understand the link between awareness and sensitivity to diversity and increased competitiveness. As employers, they seek new professionals who have the human relations skills and understanding of diversity to operate successfully within a diverse workforce and to interact with diverse clientele. These are now seen as required skills by most employers, and programs that increase student's abilities to operate in diverse settings are seen as increasing the students' chances of success as professional engineers. For engineering students, who have less opportunity within their academic programs to study human relations skills, DPD's focus on human differences, power relationships, and forms of discrimination provides a forum for exploring this complex aspect of being a successful professional. In addition, the teaching strategies recommended for DPD courses - - i.e., incorporation of interactive learning activities - - encourage students to develop communication and interaction skills while exploring some of the more complex aspects of human relations.

In addition to DPD courses increasing the quality of the engineering curriculum, this educational experience is seen as a method to increase the number of students of color who will select engineering as a profession. Students look to the curriculum for evidence of commitment to dealing with diversity issues; evidence of such commitment increases the likelihood that students of color will feel that they belong in engineering. In addition, DPD courses promise to go beyond just increasing the number of under-represented students in university engineering programs to helping to solve the problem of how to ensure students' successful completion³. There is a growing literature on the extent to which exposure to diversity and multiculturalism facilitates cognitive growth, a sense of community, and students' overall satisfaction with the college experience⁴.

The Proposed Class

We plan to offer a class during Fall 2001, entitled "Technological Innovation and Discrimination." The objective of the class is to increase students' understanding of how technology exists within a social, political, and economic context that includes discrimination and abuse of power. The specific learning objectives of the course are listed in Table 1.

Table 1. Course Learning Objectives

At the end of this course, students should be able to:
1. Describe the process of technological diffusion and its components of innovation, diffusion over space and time, and adoption by social groups.
2. Understand that differences based on race/ethnicity, gender, etc. are socially constructed phenomena.
3. Understand the importance of technology in influencing power structures in society.
4. Examine historical situations related to technological change and identify important related patterns of discrimination.
5. Critically examine present technological advances and identify potential ways in which discrimination may arise from their application.

The approach of the course is to have the students examine situations where technological innovation has stimulated or affected a pattern of socially constructed difference, which then can lead to discrimination and inappropriate use of power. We plan to examine three historical cases and one current case associated with the application of new technological innovations. The historical cases that will be examined are: 1) the sugar trade from the Caribbean (1650 to 1830); 2) US textile production (1820 to 1910); and 3) development of the US railroad system (1820-1870). The modern case that will be considered is the development of computers leading to what has been labeled the "digital divide" (see Table 2).

Table 2. Cases Examined

Case/Situation	Technology	Group Affected
Sugar Production in the Caribbean	Improved ship navigation and introduction of steam driven sugar mills	African slaves
Mechanization of Textile Production	Development of power looms	Irish immigrants
Building of the Transcontinental Railroad	Movement of goods by railroad instead of water	Irish and Chinese immigrants
Expansion of Computer Technology	Development of personal computer and information technology systems	Poor communities; persons in developing countries

The case of sugar production in the Caribbean and the impact of technological development are documented by Watts⁵ and Thomas⁶. While cane sugar production began in Barbados around 1590 by the Spanish, large-scale production occurred by the French, British, and Dutch from 1660 to 1830. Such levels of production were only made possible by the importation of West African slaves, which reached a peak of about 1 million persons by the early 1800s. The enterprise was supported by two important technological advances: improved navigational devices including Harrison's chronometer which reduced the risks associated with cross Atlantic shipping, and steam driven cane presses for extraction of syrup. The stereotypes and prejudice against Blacks that existed served to justify the systems that developed related to technological change⁷.

The case of textile production is described in detail by Cross and Szostak⁸. About 1820, the cottage industry of cloth production changed to factory production because of the availability of power looms driven by steam engines. The industry was consolidated in the large cities of the Northeast and the huge need for cheap labor was filled by employing predominantly female Irish immigrants; between 1915 and 1920, 5.5 million Irish immigrated to America⁹. Working conditions were difficult, dirty, and dangerous¹⁰. To maintain a power difference between these new immigrants and U.S. citizens, negative stereotypes of the Irish proliferated; in fact, the Irish were ascribed the same negative characteristics used to stereotype Blacks¹¹. This imposition of difference led to nearly a century of discrimination that was ultimately overcome by education and suffrage.

The building of the railroad stands as one of America's great achievements¹². Over 30,000 miles of track were laid in the U.S. between 1820 and 1860, mostly by Irish immigrants in the east and Chinese immigrants in the west. A wide range of technological advancements was required for this system including the track shape, the track bedding, standards for locomotives and cars, and a uniform time system⁸. While Chinese immigrants came to California as part of the immigration associated with the gold rush, as the mines failed, many of the Chinese were employed in the construction of the transcontinental railroad. Negative stereotypes and discrimination against the

Chinese were rampant at this time. In the later part of the 19th century as a serious recession resulted in competitions for jobs between Chinese and white laborers, laws were promulgated that placed the Chinese under the same legal discrimination as “black, or mulatto person, and Indian.”¹³ By 1879, the Chinese had become a “national problem” as described by President Rutherford Hayes; in 1892, Congress prohibited further Chinese immigration and denied any chance of citizenship¹⁴. These actions were justified at the time by ascribing negative characteristics to the Chinese, just as was done in the case of Blacks and of the Irish.

Presently, technological development of computers, including the personal computer, the Internet, and various other forms of information technology raises important questions about who has and will have access to the benefits of this technology. For example, data suggest that racial/ethnic minority groups in the U.S. have less access to computers than do whites (Figure 1). The students will be asked to investigate what impact such inequities have and what new forms of difference and discrimination are likely to result to sustain the existing power structure.

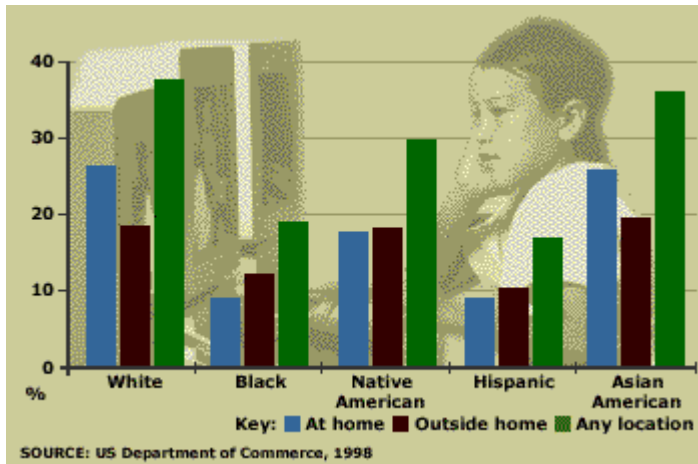


Figure 1. Percentage of Persons Using Computers by Race/Ethnicity

Course Organization

Based upon the experiences of DPD instructors at OSU, students encounter a number of typical difficulties when studying issues of difference, power, and discrimination, including:

1. A lack of understanding that race is a socially constructed concept and that differences associated with race lack a scientific or rational basis;
2. A belief that historical forms of discrimination are present and/or continue to have an impact in modern society; and
3. A belief that we all exhibit patterns of constructing differences that may lead to discrimination.

The introductory portion of the course will be conducted with a series of exercises to address these three issues. We will begin the course with exercises that invite students to reflect upon their personal values and beliefs, and identify their own cultural backgrounds and family histories of immigration. This will also lay the groundwork for further discussions during the “cognitive” portion of the course.

For the remainder of the course, we will use a series of four learning cycles on each of the topics in Table 2. The learning cycle will include educational activities for introduction and inspiration (concrete experience to reflective observation), information transfer (reflective observation to abstract conceptualization), pilot application (abstract conceptualization to active experimentation), and real world application (active experimentation to concrete experience) - - the four quadrants of the learning system described by Svinicki and Dixon¹⁵.

For the introduction and inspiration phase, we plan to use guest speakers and/or film and video to establish a foundation for recognizing difference, power, and discrimination. The information transfer phase will involve selected readings from Richard Takaki’s book, A Different Mirror: A History of Multicultural America, coupled with detailed lectures and selected readings concerning the various technological advances that had/have an impact on U.S. society, economy, and politics. We will introduce typical paradigms of technological innovation that involve invention, diffusion over space and time, and adoption by social groups. The lectures and selected readings will provide a standard historical perspective of “who, what, and when” related to the technological innovations attributes of the historical period, while the Takaki readings will describe the social adjustments that were occurring in response to technological and economic changes.

The pilot application phase of the learning cycle will involve students writing and discussing a series of study questions associated with the readings. We believe that structured questions will provide a framework in which students can best create their personal responses. Small group interactions will be used for students to share their personal responses with peers and to address separate questions that require higher levels of analysis, synthesis and evaluation. In the small groups, the students will be asked to seek collective opinions concerning the role of social, economic, and technological forces in the historical case studies.

The real world application phase will focus upon students constructing relationship patterns for the historical period of interest¹⁶. Bella has created a system by which complex systems of human interaction can be sketched so that students can see inter-relations and complex interactions. Interaction diagrams will be constructed in small groups and then shared with the entire class. Students will be able to identify within their diagrams the patterns of constructed difference, discrimination, and misuse of power as they relate to technological innovation. For engineering students, we anticipate that these patterns will allow them to identify the important and sometimes essential part that technology plays in complex human affairs. After creation of the diagrams, classroom

discussion will be focused upon important questions related to the “what if...” alternatives if different economic, social, and ethical decisions had been made.

Students will be asked to write a short paper on the solution to the “digital divide” issue in the US. The paper will require historical research on the diffusion of computers and information technologies into personal use. The students will be asked to identify societal power structures that will be affected by the “digital divide” and proposed governmental, legal, or market mechanism for solution to the problem of a further erosion of opportunity for the poor in US society.

Assessment

Assessment methods will primarily be done involving self-evaluation by students and peer-evaluation within groups. Separate from these forms, faculty evaluation will include grading of responses to study question and both in-class and out-of-class writings.

Learning Objective	Assessment
1. Describe the process of technological diffusion and its components of invention, diffusion over space and time, and adoption by social groups	Formal quiz
2. Understand that differences based on race/ethnicity, gender, etc. are socially constructed phenomena.	Self assessment at three times over the course related to interpretation of a given situational event
3. Understand the importance of technology in influencing power structures in U.S. society.	Peer evaluation of written description of relationship patterns
4. Examine historical situations related to technological change and identify important related patterns of discrimination.	Study questions and personal writings
5. Critically examine present technological advances and identify potential ways in which discrimination may arise from their application.	Short written paper

Summary

We have outlined the approach that will be use to introduce engineering students to the importance of difference, power, and discrimination in U.S. society. The course will focus on the relationship between technology and forms of discrimination based on race/ethnicity and gender, in order to develop students’ awareness of the social construction of difference and structures of power. Using learning cycles developed for the course, students will be introduced to the material through personal stories, historical information, and application exercises. Using a variety of assessment techniques, this approach will be evaluated and the results will be presented in a future paper.

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