



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Diversity Subject Aid

Author(s)

Rachelle Hollander

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Description

A short guide to some key resources and readings on the topic of diversity in the STEM disciplines.

Body

Diversity is the quality or state of having different forms, elements, or characteristics. Diversity may be found in a population or a state of affairs. Two types of diversity issues arise in discussions of science and technology policy. One has to do with design in research and technology; the other has to do with fair treatment in education and the workplace, including academia. Both types also raise issues about cultural awareness and sensitivity.

Discriminatory practices are practices that fail to treat people fairly. Fair treatment is treatment that treats similar cases similarly – that is not biased explicitly or implicitly against (or for) some because of a characteristic such as race, religion, sex, national origin, sexual orientation, physical appearance, or disability that is irrelevant to the decision at hand (e.g., job skills, intellectual preparation, or qualifications for public housing). Fair or equitable treatment may not require and in fact may prohibit equal treatment where there are differences between cases

relevant to a treatment decision. Discrimination may be intentional or unintentional. Discrimination is a form of behavior that shows prejudice, but not the only form.

Historically, some gatekeepers in higher education and the workplace have used the characteristics listed above as grounds for excluding some persons from opportunities in science, engineering, and technology. Doing so is unfair because these characteristics are not relevant grounds for the exclusions. Most ethical theories and positions, be they arguments from justice, the golden rule, utilitarianism, etc. do not justify these behaviors. However, besides these ethical reasons for encouraging and supporting diversity in the science and engineering workforce and student population, there are also reasons associated with improving the research enterprise. Diverse perspectives working in science and engineering, within a culture or internationally, bring views that can improve research and practice by raising for consideration hypotheses or methods that might otherwise be overlooked. It can be improved because the cooperation of research subjects will be greater when they see a diverse research team. A research team that includes members from the culture under investigation may be able to recognize cultural sensitivities that would otherwise interfere with cooperation.

Research and technological design is improved when attention is paid to the implications of diversity for research hypotheses and methods, and to imperatives if a technology is to be useful to populations with a wide variety of aptitudes and characteristics. Research benefits from acknowledging the relevance of cultural difference and diversity in establishing soundness and validity in research design, implementation, testing, and reporting. A basic example is the need to consider diversity and cultural differences in selecting a population to test a new device or drug and in its distribution and dissemination. Without this attention the results may lack applicability and utility to a large segment of potential beneficiaries.

See also Subject Aids: [Community-Based Research](#), [Responsible Innovation](#), [Social Justice](#).

Subject Overviews

Fullinwider, Robert. 2014. "Affirmative Action." In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta. Winter 2014 edition. Last Modified September 17, 2013.
<http://plato.stanford.edu/archives/win2014/entries/affirmative-action/>.

"Affirmative action" means positive steps taken to increase the representation of women and minorities in areas of employment, education, and culture from which they have been historically excluded. When those steps involve *preferential* selection — selection on the basis of race, gender, or ethnicity — affirmative action generates intense controversy. The development, defense, and contestation of preferential affirmative action has proceeded along two paths. One has been legal and administrative and the other has been the path of public debate. Often enough, the two paths have failed to make adequate contact, with the public quarrels not always very securely anchored in any existing legal basis or practice. This entry provides a history of U.S. affirmative action, and examines its effects in universities and the workplace.

Villeval, Marie Claire. 2012. "Ready, Steady, Compete." *Science* 335(3): 544-545. doi: 10.1126/science.1218000

The educational attainments of women exceed those of men in most developed countries, yet women continue to lag behind in access to top corporate jobs. Women are also underrepresented in politics. Without dismissing the role of discrimination, recent research has implicated a lower preference of women for competition. On page 579 of this issue, Balafoutas and Sutter show how affirmative action policies can increase the willingness of women to compete without affecting the chances of highly skilled men to succeed and while preserving post-competition cooperation between individuals.

Phillips, Katherine W. 2014. How Diversity Makes Us Smarter. *Scientific American*. <https://www.scientificamerican.com/article/how-diversity-makes-us-smarter/> Republished 2017, with Special Report: How Diversity Empowers Science and Innovation. In *State of the World's Science 2014*, *Scientific American*. Guteri, 2014. Oct. 1. Diversity in Science: Why It Is Essential for Excellence. Accessed June 27, 2017.

Decades of research by organizational scientists, psychologists, sociologists,

economists and demographers show that socially diverse groups (that is, those with a diversity of race, ethnicity, gender and sexual orientation) are more innovative than homogeneous groups. It seems obvious that a group of people with diverse individual expertise would be better than a homogeneous group at solving complex, non-routine problems. It is less obvious that social diversity should work in the same way — yet the science shows that it does. This is not only because people with different backgrounds bring new information. It is also that simply interacting with individuals who are different forces group members to prepare better, to anticipate alternative viewpoints and to expect that reaching consensus will take effort.

Bouville, Mathieu. 2008. “Is Diversity Good? Six Possible Conceptions of Diversity and Six Possible Answers.” *Science and Engineering Ethics* 14: 51-63.

Prominent ethical and policy issues such as affirmative action and female enrollment in science and engineering revolve around the idea that diversity is good. However, diversity may be construed as a factual description, a craving for symmetry, an intrinsic good, an instrumental good, a symptom, or a side effect. These descriptions differ vastly in their nature and properties. Some are deeply mistaken and some others cannot lead to concrete policies. It is thus necessary to clarify what one means by ‘diversity.’ It may be a neutral description of a given state; but this is insufficient to act. The idea that there should be the same representation in a specific context as in the overall population is both puzzling and arbitrary. Diversity as intrinsic good is a mere opinion, which cannot be concretely applied; moreover, the most commonly invoked forms of diversity (sexual and racial) are not intrinsically good. On the other hand, diversity as instrumental good can be evaluated empirically and can give rise to policies, but these may be very weak. Finally, symptoms and side effects are not actually about diversity. I consider the example of female enrollment in science and engineering, interpreting the various arguments found in the literature in light of this polysemy.

Cultural Awareness and Sensitivity

Davis, Dena S. 2000. "Groups, Communities, and Contested Identities in Genetic Research." *Hastings Center Report* 30 (6): 38-45. doi: 10.2307/3528452

Obtaining community consent before conducting genetic research seems to be a way of ensuring that a whole community is not harmed against its wishes — that all Jews, or all African Americans, or all Hutterites are not forced to learn things about themselves they would rather not know, or are not forced into identities they would rather not have. Unfortunately, there are insurmountable problems both in identifying the right representatives of the community and in obtaining their consent.

Schummer, Joachim. 2006. "Cultural Diversity in Nanotechnology Ethics." *Interdisciplinary Science Reviews* 31(3): 217-230. doi: 10.1179/030801806X113757.

Along with the rapid worldwide advance of nanotechnology, debates on associated ethical issues have spread from local to international levels. However, unlike science and engineering issues, international perceptions of ethical issues are very diverse. This paper provides an analysis of how sociocultural factors such as language, cultural heritage, economics and politics can affect how people perceive ethical issues of nanotechnology. By attempting to clarify the significance of sociocultural issues in ethical considerations its aim is to support the ongoing international dialogue on nanotechnology. At the same time the article poses the general question of ethical relativism in engineering ethics, that is to say whether or not different ethical views are irreconcilable on a fundamental level.

Seibert, P. S., P. Stridh-Igo, and C. G. Zimmerman. 2002. "A Checklist to Facilitate Cultural Awareness and Sensitivity." *Journal of Medical Ethics* 28(3): 143-146. doi: 10.1136/jme.28.3.143

United States of America demographic profiles illustrate a nation rich in cultural and racial diversity. Approximately 29% of the population is minorities, and demographic projections indicate an increase to 50% by the year 2050. This creates a highly mobile and constantly changing environment, with the need for new levels of cultural awareness and sensitivity. These issues are particularly critical where medical professionals must understand the impact

cultural differences and barriers can have on evaluation, treatment, and rehabilitation. During times of stress, such as when injury strikes, problems associated with lack of cultural sensitivity are intensified. Cultural diversity is of particular concern when standard measures for diagnosis and prognosis are derived from established norms for responding, because culture defines norms. This paper details a ten point checklist designed to facilitate cultural awareness and sensitivity in medical settings to ensure maximum successful recovery and outcomes for all patients.

Policy and Guidance

Committee on Maximizing the Potential of Women in Academic Science and Engineering, Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and Institute of Medicine of the National Academies. 2007. *Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering*. Washington, D.C.: National Academies Press. doi: [10.17226/11741](https://www.nap.edu/catalog/11741/beyond-bias-and-barriers-fulfilling-the-potential-of-women-in). Accessed at <https://www.nap.edu/catalog/11741/beyond-bias-and-barriers-fulfilling-the-potential-of-women-in> on June 28, 2017.

The United States economy relies on the productivity, entrepreneurship, and creativity of its people and the innovative capacity of all its people — women and men. However, women face barriers to success in every field of science and engineering; obstacles that deprive the country of an important source of talent. Without a transformation of academic institutions to tackle such barriers, the future vitality of the U.S. research base and economy are in jeopardy. *Beyond Bias and Barriers* explains that eliminating gender bias in academia requires immediate overarching reform, including decisive action by university administrators, professional societies, federal funding agencies and foundations, government agencies, and Congress. If implemented and coordinated across public, private, and government sectors, the recommended actions will help to improve workplace environments for all employees while strengthening the foundations of America's competitiveness.

National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. 2014. *Culture Matters: International Research Collaboration in a Changing World: Summary of a Workshop*. Washington,

DC: The National Academies Press. <https://doi.org/10.17226/18849>.
<https://www.nap.edu/catalog/18849/culture-matters-international-research-collaboration-in-a-changing-world-summary>

As science and technology capabilities grow around the world, United States-based organizations are finding that international collaborations and partnerships provide unique opportunities to enhance research and training. At the same time, enhancing international collaboration requires recognition of differences in culture, legitimate national security needs, and critical needs in education and training. *Culture Matters* is the summary of a workshop convened by the Government-University-Industry Research Roundtable (GUIRR) in July 2013 to address how culture and cultural perception influence and impact the process by which research agreements are made and negotiated across international boundaries. In this workshop, representatives from around the world and from government, university, and industry focused on research and agreements affecting or involving people/human subjects; environmental and natural resources; science, engineering, and manufacturing; and agriculture and animal issues. This report examines each of these domains and the role that culture and cultural expectations may have in the forging and implementation of international research agreements.

Prince, Robert H. 2006. "Teaching Engineering Ethics using Role-Playing in a Culturally Diverse Student Group." *Science and Engineering Ethics* 12(2): 321-326.

The use of role-playing ("active learning") as a teaching tool has been reported in areas as diverse as social psychology, history and analytical chemistry. Its use as a tool in the teaching of engineering ethics and professionalism is also not new, but the approach develops new perspectives when used in a college class of exceptionally wide cultural diversity. York University is a large urban university (40,000 undergraduates) that draws its enrollment primarily from the Greater Toronto Area, arguably one of the most culturally diverse cities in the world. Although students admitted from this international pool have usually been exposed to western attitudes during secondary education and are rapidly assimilated into Canadian culture, responses to specific ethical issues are strongly influenced by their prior culture. Two and three part scripts for case studies were written to illustrate issues such as gifts, attitudes towards women and ethnic minorities, conflict of interest, whistle-blowing, sexual harassment,

individual rights, privacy, environment, intellectual property, and others. Following presentation, the actors lead group discussion based on previously specified questions. Once the initial shyness and reluctance of some cultures has been overcome through the building of rapport, students have written original scripts based on hypothetical or prior personal situations. The method is being adopted in a short course format to assist the professional integration of foreign trained engineers.

Bibliography

National Science Foundation. 2014. "Women, Minorities, and Persons with Disabilities in Science and Engineering." Last modified October.

<http://www.nsf.gov/statistics/wmpd/2013/>.

Women, Minorities, and Persons with Disabilities in Science and Engineering provides statistical information about the participation of these three groups in science and engineering education and employment. A formal report, in the form of a digest, is issued every two years.

Laas, Kelly. Last Updated 2016. 2010. "Diversity Bibliography" Online Ethics Center for Engineering 4/21/2010 OEC Accessed: Wednesday, June 28, 2017. <https://onlineethics.org/cases/oec-subject-aids/diversity-subject-aid>

An annotated list of websites, books and articles for research on diversity issues in engineering and science.

Examples of Relevant Statements in Professional Association Codes of Ethics:

American Psychological Association Code of Ethics - Including 2010 and 2016 amendments. <http://www.apa.org/ethics/code/index.aspx>

3.01 Unfair Discrimination – In their work-related activities, psychologists do not engage in unfair discrimination based on age, gender, gender identity, race, ethnicity, culture, national origin, religion, sexual orientation, disability,

socioeconomic status, or any basis proscribed by law.

IEEE Code of Ethics

Ten basic principles include "8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin."

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OEC Subject Aids

Topics

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Diversity

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