

FEMINIST STUDIES AND ENGINEERING

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The budding study of feminism and its intersection with science and technology has brought a dynamic edge to gender and women studies. In an effort to elucidate the relationship between feminism and science, scholars have tried to establish clear definitions of these two subjects. Feminism has encountered numerous misconstructions, especially in the context of its effect on the science and engineering labor market. The various categories of feminism that have been studied over the years, such as liberal feminism, difference feminism, and ecofeminism, all provide different interpretations of what “equality for women in the workforce” means. Regardless of these different viewpoints, however, feministic scholars have repeatedly attempted to understand how women in science have contributed to the progress of science and technology (Subramaniam 526-531).

The modern feminist movement that has swept across America over the last decade, is comprised of a wide array of men women who are concerned with issues related to women’s welfare, including women’s economic or political power, the role of women in the family dynamic, how different kinds of work are understood and valued, and the representation of women in science and engineering.

At the start of the fifteenth century, when engineering originated in the form of mechanical devices for warfare, women were excluded from the practice of engineering. Then, during World War 1, women were encouraged to participate in the work force and to support the war effort. In Britain, during the war, roughly two million women replaced

men at their jobs. In Russia the quantity of women in industry went up from 26 to 43%, while in Austria a million women joined the workforce (Horting). After the war, however, women were often not allowed to keep their positions resulting in a further decline of women in engineering. In addition, because research studies at the time found sex differences in learning and achievement, women were assumed to be deficient in math and science, contributing to their lack of motivation to participate in this “male-dominated” field. This science gender gap stemmed from the idea that women lack the qualities and skills necessary for success in science. Instead, women were perceived as excessively emotional, compassionate, sociable, and less competitive, all qualities that seemed to make them unfit to pursue careers in the sciences. Fortunately, however, in recent years, feminist studies have dissected these stereotypes and misconceptions about women in science and technology (Gill, and Keller 55-72).

In discussing the progress of feminism in science, two successive branches of feminism must be examined: liberal feminism and difference feminism. The former has been the leading form of feminism in the United States directed at securing equal rights and opportunities for women as shown by the laws of affirmative action that accelerated women’s entry into the profession. Liberal feminism asserts that women are equal to men at all levels, striving to provide women with the “skills and opportunities needed to make it in a man’s world.” (Schiebinger 1-25). Although liberal feminism has made an undeniable impact on feministic studies, liberal feminism has also led us down some “blind alleys” in an attempt to mold women into a male dominated world. For example, it can be argued that in trying to ignore or deny gender differences in the work force, liberal feminists are disregarding the unique qualities and ways of thinking that women

have to offer to science and engineering. By seeing “sameness and assimilation as the only grounds for equality” (Schiebinger 1-25), some may argue that liberal feminism is forcing career-oriented women to think more like men. In the early 1980s, in response to problems faced by liberal feminism, feminist studies started to develop what is now known as difference feminism.

Difference feminism deviates from liberal feminism by stressing the noticeable differences between men and women, rather than disregarding them. It serves to bring back value to qualities and characteristics that our society has “devalued as feminine” (Schiebinger 1-25), such as empathy and subjectivity. Difference feminism emphasizes that for women to become equal to men in science, their differences need to be embraced and used advantageously, to provide a different perspective on science. In her book, “A woman’s way of knowing”, Mary Belenky comments on women in technology suggesting that women use “connected knowledge, contextual thinking, and collaborative discourse rather than separate knowledge that leads to impersonal and abstract rules and standards.” (Schiebinger 1-25). These ideas, in turn, suggest collaborative research, mutual support of each other’s contributions and to transform institutions. From 1983 to 2001, the percentage of women in engineering increased significantly from 15% to 22% due to the newfound ideas and viewpoints fostered by difference feminism (Horting).

What does it mean to take a solely feminist perspective on engineering? How can a feminist perspective influence workplace culture and professional ethics? Feminist perspectives emphasize ideas such as social justice and equality in the work force, family life, and environmental safety. Thus, to redefine science and technology from a feminist perspective, it is important to look at broader movements for social justice and peace,

including struggles against racism, militarism, environmental devastation, ecological sustainability, and global poverty (Lord 14-19). For example, the past few decades have seen much interest in both the women's movement and the ecological/ environmental movement. Many feminists agree that the goals of these two movements are “mutually reinforcing”. Ecological feminists, also known as ecofeminists, have established a number of correlations between the oppression of women, and the disrespect for nature, and these correlations are relevant in understanding why the environment is a strong feminist issue. Connections between feminism and environmentalism have been made by studying the effects of environmental pollutions and degradation on the lives of women. Toxic pesticides, chemical wastes, acid rain, nuclear radiation, and a variety of pollutants take their first and heaviest toll on women, their reproductive systems, and children. In other words, women suffer the brunt of the effects of environmental detriments such as cancers, abnormal child births, and other health effects. By 2002, the percentage of women practicing civil and environmental engineering had reached its peak of 25% (Horting). Regardless of the cause behind this woman-nature connection, environmental science and engineering has gained much attention from pioneering women scholars. Known as the mother of environmental engineering, Ellen Swallow Richards was a scientific pioneer who conducted the first water-quality studies of Massachusetts waters in 1870. Women environmental engineers continue to work together to effect change by recognizing that they have the right to participate in solving environmental problems and to increase knowledge and awareness about natural resources and environmental safety (Tang 25-40).

Women have also contributed greatly to developmental biology. As discussed by American physicist and feminist Evelyn Fox Keller, women have done well in developmental biology, both in scientific research and in the professional work force. “It is the intellectual space occupied by women in developmental biology today that has led to the subjective impression among some biologists that developmental biology is a field now dominated by women.” (Fox Keller 16-28).

It is useful to think about what might have allowed women to find this particular niche in the sciences. One theory is that development from the human zygote to the newborn human being is a process that takes place within a woman’s body. Because fertility is important in family life and in female health, it is likely that a woman perceives embryology to be worthy of her investigation. Christiane Nüsslein-Volhard was the first woman to win the Nobel Prize in developmental biology for her research on the genetic control of embryonic development. She contributed significant knowledge to her field in her studies aimed at identification of genes in the development of (fruit fly) embryos. (Fox Keller 16-28).

The chemistry of cosmetics is a fast-growing area of scientific study rooted in the daily lifestyles of women. The science of cosmetics has grown rapidly as more women have been developing ways to maintain or enhance their beauty while reducing the harmful effects caused by makeup chemicals. The recent discovery of mineral makeup has revolutionized cosmetic sciences by advertising "natural" or "organic" ingredients. Similarly, women have established alternative makeup products for certain skin types that are commonly aggravated by traditional cosmetics. Mineral makeup is not only a better

selling product, but also provides safer alternatives to the harsh chemicals that women often encounter daily. Women have made their mark as pioneers in the science of cosmetics by transforming it into a relevant and widespread field of scientific study.

The effects that feminism has had on engineering are best exemplified by those women of distinction who have made specific contributions and have actively sought to make constructive changes. The most famous woman in twentieth century science was Marie Curie, an accomplished physicist, whose work on radium and radioactive isotopes earned her two Nobel prizes. Although some of her early work was shared by her husband, after his untimely death, she continued to publish single-authored publications of great work. In addition to research, Curie taught at the local normal school and occasionally recruited students from there to work in her laboratory to encourage women in science. Marie Curie was truly a woman pioneer in science, creating pathways for women in later generations to emerge as respected and valued scientists (M. Bystydzienski, and R. Bird 24-27).

Feminism has changed how we view science and technology by allowing women to put their knowledge of topics such as environmental safety, family life, and cosmetics into constructive scientific research. Although women were initially faced with difficulties in obtaining equality in the work force, they are now encouraged to use their “maternal knowledge” of equal opportunities and social justice to make significant contributions to science and technology.

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