Innovations in Education

Teaching Gender Analytics in Science, Medicine, and Technology in Culture

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The twentieth century witnessed a historic turnaround for women in science. Historically, women had been excluded from European and U.S. universities from the twelfth century to the late nineteenth century. By the late 1800s, women were admitted nearly everywhere in Europe and the U.S. (except for a few private holdouts, such as Cambridge, Princeton, and Yale). By the mid-twentieth century women were receiving Ph.D.s, and by the end of the century had entered the ranks of the professoriate. Though numbers differed across Europe and the U.S., countable percentages of women in the rank of senior professor existed everywhere: the Netherlands stood at 6%, the United Kingdom at 9%, France and the U.S. at 14%, with Portugal and Finland enjoying the highest percentages with 17 and 18% respectively (1998 figures, ETAN 2000, 10).

In an about face from earlier policies that kept women out, including anti-nepotism rules, the 1990s witnessed extraordinary efforts by governments and funding agencies to legislate women into science. Since the European Union (EU) established its Women and Science Unit in 1998, European member states have been jockeying for the best numbers in the women-in-science competition. The French, who in the past have assumed that Enlightenment notions of *egalité* and *fraternité* would afford women equal opportunities, are now extending the politics of *parité* to the halls of science. In 2001, the French Ministry for Research launched its *Mission Parité en Sciences et Technologies* to advance research in the area of gender analytics in the sciences. The Germans have also set up governmental offices in Bonn focused on expanding equal opportunity, equal pay, increased female leadership, and "gender mainstreaming" in all "concepts, processes, and measures" in science (Ebeling, 2001). In addition, a law has been put forward to the German parliament that would set (minimum) quotas for women in senior research positions (20% by 2005). This controversial policy, if enacted, would amount to a social revolution in a country where women are still often expected to choose between profession and family, and where in 2000 women held only 7% of top-level professorships (C4) and only 3% of leading positions in top German research institutes, such as the Max-Planck Gesellschaft.

The U.S., too, initiated aggressive programs to encourage women in the sciences in the 1990s. The narrowest models for reform were established by the National Science Foundation (NSF) and the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering and Technology Development. Programs at the NSF were limited to promoting women's participation in science; the point has been to increase the supply of qualified women through fair and equitable education and career development. NSF's current ADVANCE program, designed to improve women's standing in science, will offer approximately 24 institutions $4 million each over five years to transform internal structures, such as promotion and tenure procedures, in efforts to make universities conform more comfortably to women's career patterns (NSF 2001). Many of the proposals sent to NSF borrow (though largely without acknowledgement) from the institutional changes feminists in the humanities have put in place over the past twenty years, mostly without governmental support.

In the U.S., different agencies have different track records in promoting gender equality. In contrast to the NSF's limited approach, the National Institutes of Health (NIH) opened its Office of Research on Women's Health (ORWH) in 1990, which provides a broader and deeper model for promoting equality for men and women in the sciences. The ORWH was founded with two interrelated missions: to increase the number of women in the medical profession and to reconceptualize medical research to include women. Thus the NIH took the crucial step of joining increased opportunities for women in medicine to mainstreaming gender analysis in medical research. This approach has not only increased the number of women in the medical sciences, but has also brought about a minor revolution in biomedical research (ORWH 1999). Earlier in the twentieth century, females (human and non-human) were rarely used in basic biomedical research and drug testing; since 1993, the inclusion of a representative mix of females in clinical trials has been secured by U.S. federal law. In addition, the NIH also launched the Women's Health Initiative, a fourteen-year $625 million study of historically-neglected aspects of women's health, such as heart disease, breast cancer, and osteoporosis.

The EU Commission on Women in Science has moved beyond the U.S. to generalize this approach—joining women's career advancement to efforts to correcting gender bias in the substantive outcomes of research—to all areas of scientific research, not just the biomedical. In recent years, the EU has implemented a system that evaluates potential gender bias in all government-sponsored research. Gender experts in the EU are mandated to evaluate the extent to which gender considerations have been "mainstreamed," or integrated, at all levels of research from personnel considerations, to science policy, calls for proposals, contracts, and finally into the research itself, where relevant. The EU has also implemented "Gender Impact Assessment" as part of its basic research programs.

One obstacle to mainstreaming gender analysis into science is that there are few gender experts. Here is where we as teachers of history of science enter the picture. While most people agree that a student needs to learn biology or physics in order to excel in those fields, many believe that one can just "pick up an understanding of gender along the way." Understanding gender, however, requires research, development, and training, as in any other field of intellectual endeavor.

It is our job to train students in gender analytics to prepare them as future historians of science, working scientists, or science policy makers and administrators (for sample syllabi, see Rusnock, 1999). Teaching gender in science currently takes place in at least two contexts. First are specialized courses for students who are preparing to become historians of science and who intend to research and teach in this and related areas. Courses of this type have been in place for well over twenty years. The history of gender in science is a well-developed field with great materials to teach from ever-new areas for research.

A second context in which gender in science is taught is in courses designed for students who plan to continue in science-related fields. How specifically do we get first-rate historical scholarship mainstreamed into the sciences? Some years ago I directed the Women in the Sciences and Engineering (WISE) Institute at Penn State. I was shocked that the top-flight scientists on my advisory board knew little about how to analyze how gender functions in institutions and in scholarship. I wrote my 1999 *Has Feminism Changed Science?* partly to explore some of the ways this might be remedied.

Gender in science/feminist science studies/gender science studies courses tend to attract students (by now equal numbers of women and men) from the humanities and social sciences—journalism, women's studies, political science, cultural anthropology, history, etc. These students may well hold important jobs in the future as science journalists, policy makers, legislators, university administrators, gender researchers, and so forth. It is also desirable, however, to draw a good number of students from the sciences. I have taken a number of steps over the years to increase the enrollments of sciences students in my courses, making sure that my courses fulfill humanities requirements for science and engineering students, scheduling courses so they do not conflict with labs, and so forth.

All my courses on gender in science treat three interrelated levels of analysis: 1) women's participation in science; 2) gender in the culture of the sciences; and 3) gender in research results or knowledge created. The problem of underrepresentation of women in science cannot be solved without addressing gender bias in the culture of the sciences and in the knowledge produced. It is this final area—knowledge production—where, to my mind, the most important and creative research in gender studies of science is going on at the moment. It is here where real transformation in human knowledge will take place. And it is here where science students have the greatest potential to take "gender analytics" into the laboratory and mainstream these perspectives into their future work as scientists. We begin to see the fruits of our labor when scientists can report on how feminism has brought foundational revisions to theory and practice in their fields of specialization. Primatologists, for example, no longer see nonhuman primate society predominantly in terms of aggressive and territorial males. Biologists no longer (innocently) talk about fetal androgens "masculinizing" certain parts of the brain. Federal law now requires biomedical scientists to test procedures or drugs on a proper mix of females and males (see also, Schiebinger 2003, forthcoming). I devote the second half of my semester-long course to questions concerning gender in science theory and basic research.

In addition to courses that we as historians of science give that may treat the history of women and gender across many decades and many sciences, a growing number of our scientist colleagues also teach specialized courses that focus on gender analytics in their field of study. Worthy of note is a course, "Comparative Vertebrate Embryology in Social Context" taught by Anne Fausto-Sterling at Brown University. In this course, designed for biology majors and taught in the Department of Molecular and Cell Biology and Biochemistry, she mainstreams gender analysis into a broader consideration of social contexts informing and informed by her science. Scott Gilbert also teaches gender analysis in his biology course at Swarthmore College, and Rebecca Scheckler teaches a course, "Computer Science and Gender" in the Computer Science Department at Virginia Tech, just to name a few. It is a welcome development to see a growing number of scholars grounded in gender studies working inside the sciences; this raises many new possibilities for creative collaborations between humanists and scientists.

There is still much to do in the history of gender in science. In June 2003, the EU will be hosting a meeting in Berlin to explore how gender functions in the industrial sciences, a topic that is not much developed in the U.S. There is also an urgent need to study gender in science cross culturally. While efforts are underway now to understand how historical traditions within Europe have yielded different experiences for women in the sciences (low numbers in Germany and the Netherlands, relatively high numbers in France and Italy), there is very little scholarly work on how gender functions in the sciences outside of Europe or North America. Where science is organized on a Western model in, say, China, Brazil, or India, one supposes gender dynamics are similar to those found in Europe or in the U.S. What is the picture, however, for traditional Chinese astronomy, Amazonian herbalism, or Indian forestry? Or, looking elsewhere, what role does women's traditional language in Japan play in the development of gender patterns in Japanese science today? There is so much more to know. It is an exciting time to cultivate students' thinking in this vibrant field of study.

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