

**CURIES Conference on Women in Science, Mathematics and Engineering:  
A Report with WEPAN Contributions**

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In May 1994, CURIES (Cross University Research in Science and Engineering), a collaborative working group on research and *praxis* concerning women and gender in science, engineering and mathematics, held a state-of-the-art conference to establish a knowledge based on factors affecting the participation of women of all races in science, mathematics and engineering. The CURIES working board consists of Cinda-Sue Davis (the University of Michigan), Angela Ginorio (the University of Washington), Carol Hollenshead (the University of Michigan), Barbara Lazarus (Carnegie Mellon University), and Paula Rayman (Wellesley College). This conference will eventually have two outcomes: (1) an edited book of commissioned articles that is intended to be a standard reference work for the next five to eight years; that includes (2) a research agenda and related practice recommendations for the next decade.

The CURIES Conference process and potential outcomes were discussed at the 1994 WEPAN conference. This paper summarizes the background and process of the CURIES conference, as presented at the 1994 WEPAN conference, as well as outlining the results of a working exercise conducted with WEPAN members during the presentation.

**Background: CURIES Conference and Publication/Dissemination Plans**

With assistance of a planning grant from the Sloan Foundation in July 1993, CURIES and a selected Advisory Committee of experts and leaders in the field, identified critical themes that need to be addressed in order to improve the environment for women in science, mathematics and engineering. This group proposed that the seven theme areas developed at this planning meeting be addressed at a Conference and authors be commissioned to write significant papers on each of these specified topics. These papers were discussed at a three day May 1994 working CURIES Conference at Wellesley College by an invited group of researchers, scientists, and policymakers.

Authors are currently revising their papers based on the comments of discussants and Conference attendees. The Conference and a subsequent Authors Meeting, held in June of 1994, will ultimately result in the development of a Research and Policy Agenda for the next decade. Following the Authors Meeting, the Working Group will put the Research and Policy Agenda into final draft form and distribute to key actors for comment. A subset of the Conference participants and top policymakers will meet later in the fall of 1994, in Washington, DC to review the agenda.

The commissioned papers will be published in an edited volume; the Research and Policy Agenda will be included in the edited volume but will also be

released in advance of the book as a stand-alone document designed to have the widest possible impact upon researchers, policymakers, and practitioners.

### Conference Themes

Commissioned papers pulled together existing knowledge across disciplines, analyzed the extent and quality of our knowledge, identified gaps and discussed the implications of our knowledge-base for policy, practice, and resource allocation.

Underlying all of the Conference themes was the assumption that given the social construction of science and the institutional policies and practices which serve to define the environment of higher education, we need to understand the points of resistance that women encounter within our institutions. Ultimately, greater clarity about these should shape institutional change.

The following Conference themes were examined:

1. *The Facts:* What are the demographic realities, as well as the myths, concerning women in science, math, and engineering at various levels? The paper identified areas where there is not good data and emphasized the importance of reporting data in appropriate disaggregated forms. Getting the facts straight can show where attention and funds should be directed. Moreover, the demographic paper served as a springboard for a paper on diversity.
  2. *Diversity Among Women:* We need to understand women's involvement in science education and careers as it relates to the diversity among women, along lines of race, class, sexual orientation, physical and learning disability, and age. Because of the critical nature of this topic, in addition to the specific paper devoted to diversity, the authors of the other papers were also asked to address questions of diversity with regard to their particular topics.
  3. *Institutional Issues:* Moving beyond compensatory programs to structural institutional change is paramount. How are women in science affected by the attitudes, interactions, and structures of the institutions within which they work or study? What institutional structures and practices are most critical and most in need of reform? Given higher education's role as the "gateway institution" it is necessary to look in depth at the university as the critical institutional construct.
- Institutional issues are at the heart of the Conference themes. A cluster of concerns make up several key subthemes, which include: (1) how can we facilitate institutional transformation? (2) what are the experiences of women at different types of institutions, from large research universities to small liberal arts colleges? (3) how do the norms and structures of the disciplines differ, for example, between science and engineering? and (4) what, if anything, different happens when there is a critical mass of women in a field?
4. *Pipeline:* The 'pipeline' issues affecting women's connection with science, mathematics and engineering are not merely demographic. There are both developmental and sociological issues at all life stages. While the Conference will focus primarily on postsecondary education and beyond, this paper considered K-12 education which is especially critical for African American, Latino and Native American girls. The paper addressed the causes

of underrepresentation of women at each level from K-12 to senior levels in academia, industry and government.

5. *Careers*: What is happening to women at the career stage in government, industry and academia? Career topics fall within the general theme of institutional issues, but, because of their critical importance and the relative lack of attention given to these issues to date, they were addressed in a separate paper.

6. *Interventions*: What do we know about the effectiveness of the full range of intervention strategies intended to enhance the recruitment and retention of women in mathematics, engineering, and science and about the institutional setting necessary for success? We need to assess what we know and do not know for use in planning interventions and long term change. This paper was of most interest to practitioners and will be written in a manner that is useful to those who are on the "front lines" in the field.

7. *Public policy*: How do public policies drive institutional change affecting women in engineering, mathematics and science? Public policies, over and above the individual institution level can affect the cause of events and shape institutional responses. There is a need to consider the impact of larger policy decisions on how we do science and on women's participation in science, mathematics, and engineering. This paper looked at the question of selected social interventions and public policy, for example, employment policies, affirmative action, and immigration policies. The point was to bring into this discussion a more sophisticated approach to pursuing change.

The seven conference themes were covered in nine commissioned papers. The titles and authors of the papers were as follows:

**Women in Science, Mathematics and Engineering: Myths and Realities.**  
Betty Vetter

**The Schooling of Girls: Optimizing Opportunities or Obstacles?** Jane  
Butler Kahle

**Women in Academic and Non-Academic Careers in Science and Engineering.**

Mary Frank Fox: Academic Career

Paula Rayman and Jennifer Jackson: Non-Academic Careers

**Women in Science and Public Policy.** Shirley M. Malcom and Daryl  
Chubin

**Programmatic and Curricular Interventions: What Do We Know?**  
Cinda-Sue Davis and Sue Rosser

**Diversity Issues in Science and Engineering.** Beatriz Clewell and Angel B.  
Ginorio

**Women Graduate Students in Engineering & Science: Rethinking a Gendered Institution.** Carol Hollenshead, Barbara Lazarus, Indira Nair, and Stacy Wenzel

**Women in Science: Institutional Factors that Affect the Development of Women's Scientific Talent and Recommendations for Structural Changes.** Helen S. Astin and Linda Sax.

### **WEPAN Contributions to the CURIOS Conference Outcomes**

WEPAN participants attending this session at the June 1994 conference were asked the following question: *If money were no object, and you could establish a particular research study, programmatic intervention or policy statement that you wished, what would it be?* This question is very similar to a question posed to participants at the CURIOS conference. WEPAN membership is very diverse, representing faculty, students, WIE program administrators, K-12 teachers, industry, etc. I was particularly interested in learning what the concerns around research, practice, and policy were for this group and to see how they compared to those participants at the CURIOS conference. The WEPAN participants responses are outlined below:

#### **Research:**

Delineate differences in women vs. minority programs, problems, etc. Why should there be different people having these different programs?

Research obstacles/opportunities for young girls who have multiple diversity issues, e.g., a multi-ethnic female who is a lesbian.

I would like to see a software program written that would simplify evaluation and become widely used and recognized.

National Comprehensive Data re: Do pre-college and retention programs really work?

Would like to have the financial resources to hire a director (full time) to coordinate the many programs we have for middle school girls and furthermore to track these girls.

I would like a statistician and statistical computer program to evaluate my program.

I would like to see compilations of research and evaluation techniques. We don't have to reinvent the wheel each time we start. As part of this, devote portions of WEPAN and other national meetings to workshops.

Conduct Conference on Gender and Mentoring in Engineering and Science Graduate Program

Research what University curriculum changes (Engineering) would make engineering programs more appealing/fulfilling for women and then DO IT!



Having NSF (or other funders such as Sloan) directly contract with an evaluation specialist would save a lot of time, money, energy, with better, more consistent, more objective, and more useful results.

#### **Practice:**

I would like to have funding for national or international speakers and hands-on teachers (e.g. an astronaut presenting an activity to my students in middle school).

I would like to see summer science camps for middle and high school girls using a women's college model.

More scholarships and financial aid awarded to women in engineering.

I would like to see less resistance to all female programs at the K-12 level.

I would like to see more women biographies in the science and engineering fields at all grade levels.

I would like to see faculty involved in sensitivity training with respect to women and minorities and take on more of the responsibility of becoming mentors and counselors.

We need funding for more programs for the K-12 students, particularly for lower grades (institutionalize the programs).

Improve information plan (to high school girls and college freshmen especially) regarding possible careers as an engineer (including academic positions, industry, and other options) via either career classes, workshops or contact with women mentors/roles models.

Run an educational program for faculty and graduate students on teaching and gender issues in the classroom.

I would like to see the researchers be more willing to involve practitioners - deans, WIE directors, faculty - in CURIES meetings for the mutual benefit of all and ultimately of our students. CURIES work would be more useful, more used, and more effective if the circle were broadened.

#### **Policy**

Tenure would be significantly different or abolished.

Require major curricular change within the universities who educate our educators. Graduating teachers should learn how to teach math and science to encourage and sustain interest in these areas.

Requirement in K-12 training to address equity issues in science and math.

Curriculum committees become flexible and allow faculty more freedom to experiment teaching courses geared to different learning styles and types of students, etc.



I think we need to figure out how to use NSF/Doe, etc.. to use its considerable clout (i.e. grant-giving) to reward PI's who support women and minorities in science and engineering.

University curriculum (Engineering) program must have a minimum of 25% female faculty.

I would like to see a WISE program fully funded and staffed on my university campus.

All colleges of education would include curriculum on: gender issues, thinking outside of the box, and experience in a situation whereby the student is part of the minority.

I would like to see all engineering faculty attend a mandatory workshop on teaching and gender and race/ethnicity issues at their institution, each year, every year.

I would like to see permanent, institutionalized offices of

- \* Women in Engineering
- \* Minorities in Engineering
- \* Instructional Development

at every college of engineering at every university.

I also agree that I want to have the WISE Program institutionalized (even with one full time staff member) so we could have time for planning and evaluation.

Modify tenure process so that tenure is based either on a research track or a teaching track, to allow researchers to focus on their research and teachers to focus on teaching. End goal is to have improved teaching for engineering students by faculty who truly want to teach.

These suggestions are remarkably similar to those developed by CURIUS conference participants. They were tabulated and shared with authors at the June 1994 CURIUS authors meetings and will be used in the development of the Research and related Policy agendas. They will also be very useful in the revision of the commissioned papers.

