Breaking Barriers and Creating Inclusiveness: Lessons of Organizational Transformation to Advance Women Faculty in Academic Science and Engineering

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Purpose

- To qualitatively describe the emerging organizational transformation experience of 19 US universities, funded in the first two rounds of NSF’s ADVANCE IT program, that have aimed to increase the participation of female faculty in all S&E ranks and in leadership.
- To develop a generalized framework for how organizations can enable gender equity through transforming their structures and cultures.
The lack of women’s representation and inclusion, particularly in senior positions, remains a problem for academic S&E (c.f., Valian, 1999; Etzkowitz, Kemelgor & Uzi, 2000; Burke & Mattis, 2007; Stewart, Malley, & LaVaque-Manty, 2007).

Systematic, historical, and widespread inequities (in representation and inclusion) persist at every stage of the academic pipeline: hiring, tenure, promotion, and leadership (Ginther & Kahn, 2006; National Academies’ Report Beyond Bias and Barriers).
Background - The Leaky Pipeline of Women’s Representation in Academic S&E

Academic pipeline for women

Adapted from Mason et al, 2005
### Background - The Experience of Women Faculty in S&E

#### Women in non-tenure track positions:
- may rarely be provided opportunities for professional advancement
- may not have their performance regularly reviewed or rewarded
- may rarely find their positions converted to full-time or tenure track and rarely receive priority consideration when they are
- may be shut out of the faculty governance processes by the institutions that appoint them (American Association of University Professors, 1996).

#### Women in tenure track positions:
- experience isolation, have fewer role models and mentors and have to work harder than their male colleagues to gain credibility and respect (e.g., Liang & Bilimoria, 2007; Rosser, 2004)
- report lower satisfaction with their academic jobs than do male faculty (e.g., Bilimoria et al., 2006; Callister, 2006).
NSF ADVANCE IT

- To stem the leaks and eradicate the barriers described above, in 2001 NSF initiated the ADVANCE Institutional Transformation (IT) program for increasing the participation and contributions of women in the S&E workforce ([www.nsf.gov/advance](http://www.nsf.gov/advance))

- ADVANCE IT awards were instituted to fund innovative programs to result in the “full participation of women in all levels of faculty and academic administration, particularly at the senior academic ranks, through the transformation of institutional practices, policies, climate and culture” (National Science Foundation, 2005)
Methods

- We analyzed the websites, annual reports, publications, and research & evaluation reports of 19 universities funded by NSF ADVANCE
- We also drew on interviews with 54 ADVANCE project team leaders and senior faculty at these universities about the nature and outcomes of their efforts (Bilimoria & Valian Presentation at 2006 NSF ADVANCE PI Meeting, Washington, DC)
Institutions Studied: 19 NSF ADVANCE IT (1st and 2nd Round) Awardees

- Case Western Reserve University (http://www.case.edu/admin/aces/)
- Georgia Institute of Technology (http://www.advance.gatech.edu/)
- Hunter College, City University of New York (http://www.hunter.cuny.edu/genderequity/)
- Kansas State University (http://www.k-state.edu/)
- New Mexico State University (http://www.nmsu.edu/~advprog/)
- University of Alabama at Birmingham (http://main.uab.edu/)
- University of California, Irvine (http://advance.uci.edu/)
- University of Colorado, Boulder (http://advance.colorado.edu/)
- University of Maryland, Baltimore County (http://www.umbc.edu/advance/index.html)
- University of Michigan (http://sitemaker.umich.edu/advance/home)
- University of Montana (http://pace.dbs.umt.edu/)
- University of Puerto Rico, Humacao (http://cuhwww.upr.clu.edu/~advance/)
- University of Rhode Island (http://linux.wdg.uri.edu/adv_redir/)
- University of Texas, El Paso (http://academics.utep.edu/Default.aspx?alias=academics.utep.edu/nsfadvance)
- University of Washington (http://www.engr.washington.edu/advance/)
- University of Wisconsin, Madison (http://wiseli.engr.wisc.edu/)
- Utah State University (http://websites.usu.edu/advance/)
- Virginia Polytechnic Institute & State University (http://www.advance.vt.edu/)
Findings (1) - Transformational Initiatives Undertaken

**Pipeline Initiatives**, aimed at:
- increasing the inflow of women into the pipeline
- improving the institutional structures and processes related to academic career transition points (recruitment, tenure, promotion, leadership)
- better equipping women to successfully progress in the pipeline

**Climate Initiatives**, aimed at:
- improving the awareness and practices of male colleagues through education, training, and development
- engaging in efforts to make departments (micro-climates) more collegial, egalitarian, equitable and transparent
- increasing organizational awareness of diversity and inclusion issues
**Increasing the Flow into the Pipeline**
- For non-tenure track faculty:
  - Research funds
  - Mentoring, coaching
  - Career development
- For undergraduates, graduates, & post-docs:
  - Special programs for academic career tracks
  - Scholarships
  - Summer research experiences
  - Mentoring
- For high school students:
  - Specially developed science & math courses
  - Introductory program into engineering

**Improving Institutional Structures & Processes Related to Transition Points**
- Recruitment:
  - Special committees to study and help with recruitment
  - Assistance to search committees in identifying and meeting with candidates
  - Training to search committees on potential biases and best practices
  - Funding for targeted recruitment
  - Dual career hiring policies & practices
  - Tools & resources for search committees
- Promotion, Tenure, Retention & Advancement to Leadership:
  - Special committees to study processes of P&T
  - Tools & training for decision makers on evaluation biases & best practices
  - Information sessions for faculty to increase transparency in decision making
  - Special consultants and mentors for women reaching promotion/tenure
  - Tenure extension policies

**Improving Departmental (Micro) Climate**
- Women in non-tenure track positions’ experience
- Pre-tenure women’s experience
- Tenured women’s experience

**Climate Initiatives**
- Advisory councils on women & minorities
- Information sessions & presentations
- Conferences, leadership retreats
- Distinguished lectureships by senior women
- Gender awareness training for students
- Interactive theater presentations
- Publicizing family-friendly policies

**Academic Pipeline for Women**
- Receiving PhD
- Entering a tenure-track position as assistant professor
- Tenure and/or promotion to associate professor rank
- Promotion to professor rank
- Advancement to leadership

**Improving Organizational Awareness**
- Advisory councils on women & minorities
- Information sessions & presentations
- Conferences, leadership retreats
- Distinguished lectureships by senior women
- Gender awareness training for students
- Interactive theater presentations
- Publicizing family-friendly policies
## Illustrative Examples of Coaching, Mentoring and Faculty Development Programs

<table>
<thead>
<tr>
<th>NSF ADVANCE Institution</th>
<th>Activities</th>
<th>Mentoring Process</th>
<th>Assessment &amp; Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Western Reserve University</td>
<td>Executive coaching; Hotline coaching</td>
<td>A professional executive coach provides performance- and career-related advice to women faculty, chairs, and deans. A coaching hotline was set up to deal with emergent issues.</td>
<td>Executive coaching receives consistently high annual evaluations of coaching effectiveness.</td>
</tr>
<tr>
<td>Kansas State University</td>
<td>Parallel Paths began in early 2004 with two seminars and one retreat.</td>
<td>A group-based mentoring program: those who volunteered to be a part of the program were assigned to two groups, called Prides. The Prides have been meeting once a month to explore and discuss a variety of faculty issues.</td>
<td>Major outcomes include mentoring of faculty during monthly meetings, development of teaching awards for the faculty, funding of projects.</td>
</tr>
<tr>
<td>New Mexico State University</td>
<td>ADVANCE mentoring program for STEM faculty: a peer mentoring program</td>
<td>Junior faculty are paired with senior faculty in different but related departments. Meeting once a month and regular informal social gathering are expected.</td>
<td>NA</td>
</tr>
<tr>
<td>University of Texas at EL Paso</td>
<td>Faculty mentoring program for women</td>
<td>Based on mutual interest, new women faculty are assigned to two mentors: one from within their college and one from another college. At least one mentor is a woman. Since fall 2004, the mentoring program moved toward team mentoring: two mentors are assigned a small group of new faculty for 18 months</td>
<td>NA</td>
</tr>
<tr>
<td>University of Washington</td>
<td>Mentoring women for academic leadership; Mentoring women graduate students; Mentoring pre-tenure faculty.</td>
<td>For pre-tenure faculty, a group mentoring program occurs at a peer level and across ranks with activities including informal lunches, topical workshops and other opportunities to share resources and information.</td>
<td>NA</td>
</tr>
<tr>
<td>University of Wisconsin-Madison</td>
<td>Women Faculty Mentoring Program</td>
<td>Senior women faculty from an outside department but within the same division voluntarily serve as mentors for junior women.</td>
<td>NA</td>
</tr>
</tbody>
</table>
Findings (2) – Institutionalizing the Transformation

- **New Structures, Positions, and Groups**: e.g., new positions such as ombudspersons, equity advisors, endowed chairs, institutional researchers, and provosts/deans for faculty development and diversity; family-friendly structures, such as child care facilities and lactation centers for nursing mothers

- **New and Modified Policies**: e.g., tenure clock extension, dual-career hiring, job sharing, work release policies (such as maternity/paternity leave in case of child birth or adoption; family medical leave in case of sickness of any member of the family, including parents) and family-friendly benefits policies (e.g., domestic partner health benefits)

- **Adoption of Change Initiatives as Regular Organizational Processes**: e.g., institutionalization of special funding programs, leadership development programs, and mentoring programs

- **Tool Kits, Guidelines, and Resources for Improved Practices**: e.g., systematic documentation of best practices in the form of tool kits, guidelines, best practice guides, evaluation forms, training manuals, presentations, and pamphlets (see [http://research.cs.vt.edu/advance/index.htm](http://research.cs.vt.edu/advance/index.htm))
# Illustrative Examples of New Structures, Policies, and Procedures

<table>
<thead>
<tr>
<th>NSF ADVANCE Institution</th>
<th>New Structures, Policies, and Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case Western Reserve University</td>
<td>3 new endowed chairs for women faculty in S&amp;E; Assistant Dean of Faculty Development and Diversity in the School of Medicine, Associate Dean of Faculty Development in Case School of Engineering, a diversity specialist position in the Provost’s Office; a research analyst position in the Institutional Research office; a graduate student position in the FSM Center for Women; creation or revision of university faculty policies including automatic pre-tenure extension and work release policies</td>
</tr>
<tr>
<td>New Mexico State University</td>
<td>Dual career couples: New Mexico State University and the University of Texas at El Paso support efforts to accommodate the needs of dual career couples. Job sharing arrangement may be established when two people are in the same academic department.</td>
</tr>
<tr>
<td>University of Alabama at Birmingham</td>
<td>Family-friendly leave policies: family and medical leaves of absence; personal leave of absence, sick leave and emergency absences</td>
</tr>
<tr>
<td>University of California, Irvine</td>
<td>Family Policies: Career partner program; The UC faculty family friendly edge; UC family friendly policies for faculty and other academic appointees.</td>
</tr>
<tr>
<td>University of Rhode Island</td>
<td>Dual career partners: Proposed dual career guidelines; Parental leave policy; Tenure clock extensions; Child care</td>
</tr>
<tr>
<td>University of Washington</td>
<td>Policy transformation: Recommendations to Chairs for Facilitating Dual Career Hires; Family leave and tenure clock extension; Dual Career Hires; Part-Time Faculty policies</td>
</tr>
<tr>
<td>Utah State University</td>
<td>Dual Career Committee; Dual Career Accommodation Protocol: Inform candidates about dual career opportunities; Request dual career accommodation; Identify possibilities for accommodation; Contact target units; Evaluate and interview the potential candidate; Negotiate a financial package; Write a request letter to the executive vice president and provost; Receive confirmation letter from executive vice president and provost; Make an employment offer.</td>
</tr>
<tr>
<td>Virginia Polytechnic Institute and State University</td>
<td>Child care; Stop-the-clock policy: Meetings with department heads aim to develop better understanding of the policy and to encourage more consistent implementation.</td>
</tr>
</tbody>
</table>
Findings (3) - Factors Facilitating Transformation

**Internal Factors**
- Senior administrative support and involvement
- Widespread collaborative leadership and synergistic partnerships
- Clear vision, flexible path, and milestones
- Visibility of actions and outcomes (small wins strategies)

**External**
- NSF funding
- Cohort of NSF ADVANCE peer universities (best practice sharing)
Findings (4) – Research and Evaluation in Support of Transformation

**Systematic efforts to:**

- **Track Key Indicators of Representation, Equity, and Inclusion:** e.g., NSF ADVANCE indicators, additional monitoring tools as cohort analyses and flux charts.
- **Conduct Faculty Climate Studies:** e.g., climate surveys, interview and focus group studies, resource equity studies.
- **Conduct Benchmarking Studies** of leading departments and universities.
- **Evaluate Programmatic Interventions**
- **Strengthen the Institutional Research Infrastructure** (Improve Internal Collection, Analysis, and Use of Data): e.g., templates for faculty databases, initial resources for database creation and maintenance, just-in-time training tools for more equitable personnel decision making, and presentations of analyses and recommendations to senior administrators.
### Key Indicators of Women’s Representation, Resource Equity, and Inclusion

<table>
<thead>
<tr>
<th>NSF ADVANCE Indicator</th>
<th>Shows …</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> Total # and % of women faculty in S&amp;E by rank and department</td>
<td>… the representation of women at various transition points in the S&amp;E pipeline</td>
</tr>
<tr>
<td><strong>2.</strong> # and % of women faculty in tenure-line positions by rank and department</td>
<td></td>
</tr>
<tr>
<td><strong>3.</strong> Tenure and promotion outcomes by gender</td>
<td>… the extent to which tenure and promotion processes are free from gender bias</td>
</tr>
<tr>
<td><strong>4.</strong> Years in rank by gender</td>
<td></td>
</tr>
<tr>
<td><strong>5 (a)</strong> Time at institution and <strong>(b)</strong> Attrition by gender</td>
<td>… the leaks in the pipeline</td>
</tr>
<tr>
<td><strong>6.</strong> # of women in S&amp;E who are in non-tenure-track positions (teaching and research)</td>
<td>… the representation of women in off-track positions</td>
</tr>
<tr>
<td><strong>7.</strong> # and % of women S&amp;E faculty in administrative positions</td>
<td>… the representation of women in leadership and positions of influence</td>
</tr>
<tr>
<td><strong>8.</strong> # of women S&amp;E faculty in endowed/named chairs</td>
<td></td>
</tr>
<tr>
<td><strong>9.</strong> # and % of women S&amp;E faculty on promotion and tenure committees, and executive committees</td>
<td></td>
</tr>
<tr>
<td><strong>10.</strong> Salary of S&amp;E faculty by gender (controlling for department, rank, years in rank)</td>
<td>… if resource allocation is equitable</td>
</tr>
<tr>
<td><strong>11.</strong> Space allocation of S&amp;E faculty by gender (with additional controls such as department, etc.)</td>
<td></td>
</tr>
<tr>
<td><strong>12.</strong> Start-up packages of newly hired S&amp;E faculty by gender (with additional controls such as field, department, rank, etc.)</td>
<td></td>
</tr>
<tr>
<td>NSF ADVANCE Institution</td>
<td>Respondents</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Case Western Reserve University (2004) <a href="http://www.case.edu/admin/aces/">www.case.edu/admin/aces/</a></td>
<td>39% response rate (508/1303)</td>
</tr>
<tr>
<td>Georgia Institute of Technology (2002-03) <a href="http://www.advance.gatech.edu/measure.html">www.advance.gatech.edu/measure.html</a></td>
<td>76% response rate</td>
</tr>
<tr>
<td>University of Colorado, Boulder (2003) advance.colorado.edu/research.html</td>
<td>78% response rate (449/575)</td>
</tr>
<tr>
<td>University of Michigan (2002) sitemaker.umich.edu/advance/reports_publications_and_grant_proposals</td>
<td>38% response rate (536/1398)</td>
</tr>
<tr>
<td>Utah State University (2004-05) <a href="http://websites.usu.edu/advance/Document/index.asp?Parent=6308">http://websites.usu.edu/advance/Document/index.asp?Parent=6308</a></td>
<td>74% response rate (308/416)</td>
</tr>
<tr>
<td>Virginia Polytechnic Institute and State University (2005) <a href="http://www.advance.vt.edu/Measuring_Progress/Faculty_Survey_2005/Faculty_Survey.htm">www.advance.vt.edu/Measuring_Progress/Faculty_Survey_2005/Faculty_Survey.htm</a></td>
<td>Total participants: 1209</td>
</tr>
</tbody>
</table>
## Findings (5) – Transformational Outcomes

Number of Universities Reporting Changes in the Representation of Women in the S&E Tenure Track Pipeline since NSF ADVANCE IT Program Implementation (3-5 years)

<table>
<thead>
<tr>
<th>% Increase in 3-5 years</th>
<th>Assistant Professors (Junior Rank) (n=13)</th>
<th>Associate Professors (Middle Rank) (n=13)</th>
<th>Professors (Senior Rank) (n=13)</th>
<th>Leadership Roles (n=11)</th>
<th>Total Number of Female Faculty (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-9%</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10-19%</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>20-29%</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>30-39%</td>
<td>2</td>
<td>2</td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>40-49%</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>50-59%</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>60-69%</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>70-79%</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>80-100%</td>
<td>1</td>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>&gt;100%</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total # of universities reporting % increase</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>No Change</td>
<td>2</td>
<td>1</td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>% Decrease</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>
A Model of Institutional Transformation for Gender Equity and Inclusion

Factors Facilitating Transformation

**Internal**
- Senior administrative support and involvement
- Widespread collaborative leadership and synergistic partnerships
- Clear vision, flexible path, and milestones
- Visibility of actions and outcomes

**External**
- NSF funding
- Cohort of NSF ADVANCE peer institutions

Research & Evaluation in Support of Transformation
- Tracking Key Indicators of Representation, Equity, and Inclusion
- Benchmarking and Climate Studies
- Evaluation of Interventions
- Improving Internal Collection, Analysis, and Use of Data

Transformational Initiatives To Remove Inequities and Create Inclusiveness

**Pipeline Initiatives:**
- Increasing the flow into the pipeline
- Improving organizational structures and processes related to key career transition points
  - Recruitment
  - Promotion
  - Advancement to leadership
- Equipping women and minorities to successfully progress in the pipeline
  - Career stage-specific inputs

**Organizational Climate Initiatives:**
- Improving the awareness and practices of male colleagues and decision makers
- Improving departmental (micro) climates
- Increasing organization-level attention to diversity, equity, and inclusion issues

Transformation Outcomes
- Increased representation of women and minorities at all ranks and in leadership
- Equitable, inclusive and energizing workplace for all

Institutionalizing the Transformation
- Creating new structures, positions and groups
- Implementing new and modified policies
- Incorporating successful change initiatives
- Creating tool kits and guidelines, and providing resources for improved practices
Conclusions - Enabling Equity Requires Comprehensive Organizational Transformation

- Simplistic or piecemeal solutions cannot eradicate systematic, historical, and widespread gender inequities
- Organizations need to implement wider and deeper change, systematically transforming structures, processes, work practices, and mental models that perpetuate inequity
- In the process of such transformation, the workplace becomes supportive and motivating for all its employees, not just women and other minority groups

Supporting literature: McCracken, 2000; Meyerson & Fletcher, 2000; Thomas & Ely, 1996
Characteristics of Environments That Enable Gender Equity and Inclusion

- Work structures and cultural norms that support positive relations between men and women
- Freedom from stereotyping about women’s and men’s roles and occupations
- Work conditions (e.g., job titles, work schedules, policies, and physical environment) that include and value both men and women
- A critical mass of women
- Opportunities for reward and advancement based on qualifications, performance and talent, not gender
- Work policies and structures that support work-life integration

http://www.womensdirectorategov.yk.ca/pdf/workplaces_that_work.pdf
Lessons from NSF ADVANCE IT for Universities Seeking Gender Equity

- Comprehensive institutional change to promote gender equity and inclusiveness requires simultaneous multi-impact initiatives. Universities must tackle transformation at multiple levels at the same time. Hence, awareness creation, skill building, empowerment, leadership development, process improvements, policy modifications, and structural changes need to occur simultaneously.

- Create and support a transformation team composed of senior faculty leaders and administrators to comprehensively tackle the issues of women’s under-representation.

- Such a team can help align and deploy the internal and external factors that facilitate transformation, as identified in the model.

- Universities should systematically engage in a combination of top-down and grassroots change efforts, targeting the removal of barriers constraining women at specific transition points in the S&E pipeline and improving the macro- and micro-academic climates in which female faculty work. As the ADVANCE IT experience highlights, special initiatives and activities encouraging the partnership of men in gender equity changes at all hierarchical levels must be undertaken.

- Resources for institutionalizing successful and stable initiatives, as determined by institution-specific research and evaluation, must be made available.

- Gender equity data should be tracked and research findings shared regularly among decision makers. System-wide efforts must be undertaken across academic S&E to develop and institutionalize the data collection and reporting practices that ADVANCE IT efforts have suggested are instrumental for transformation in academic institutions.

- Increase dissemination of information on gender equity resources to employees and others by using multiple communications channels.
Limitations

- **Data limitations** –
  - not all activities and outcomes may have been available on websites and reports.
  - Data were collected in 2006-07; thus the time frame may have been too short to fully assess changes in the inclusion experiences of women S&E faculty, especially in 2\textsuperscript{nd} cohort institutions
  - Since the interventions were conducted, by and large, simultaneously within each ADVANCE institution without careful attention to experimental conditions, manipulations, or controls, our review could not tease out which solutions worked better than others

- **Analysis limitations** –
  - Variations in time frame for outcomes and variations in the baseline representation of women faculty in S&E among institutions posed difficulties in assessing transformation outcomes
Future Research

- Since the interventions were conducted, by and large, simultaneously within each ADVANCE institution without careful attention to experimental conditions, manipulations, or controls, our review could not tease out which solutions worked better than others. Future empirical research should attempt to identify the specific circumstances and structures needed for effective gender equity solutions within a comprehensive change project.

- Future research should more specifically address the role of external facilitating factors (funding agencies, accrediting agencies, peer institutions) in university transformation.

- Sustainability of outcomes achieved needs to be studied more carefully by future research.