UNIVERSITY OF WASHINGTON
NSF ADVANCE Proposal

PROJECT DESCRIPTION

I.   INTRODUCTION

More than three decades ago, researchers began to study the differential experience of women faculty and students in colleges and universities. The term "chilly climate" became the catchphrase to describe the learning and work environment for women on campus. Today, the situation is still serious enough that Shirley Malcom, head of the Education and Human Resources Directorate for the AAAS, can ask: "Why, despite the movement in science and engineering, haven't women advanced more within these fields? How, for example, have even the most senior women faculty in our most prestigious institutions found themselves outnumbered and overlooked?" She locates the barriers to women's success in the structure of our institutions, agencies, societies, academies, and departments. Her message is that we must fix the system, not the women [1].

President Richard McCormick and the Board of Regents of the University of Washington (UW) are deeply committed to the notion that diversity and excellence go hand in hand. Four of the ten Regents are women, and the president has appointed women and people of color to leadership positions: eight of the sixteen deans at UW are women and two are African-American men (as of July 1, 2001). The UW's institutional priority on diversity is well-matched to the goals and objectives of NSF ADVANCE. The program proposed here will build on this strong institutional commitment to the advancement of women in leadership positions. In addition, we will partner with the following corporate colleagues in the Northwest who share this goal: Boeing, Weyerhaeuser, CH2M HILL, and REI.

UW is committed to creating an environment in which all are welcome and provided with the resources and support they need to excel. In this effort, we focus on graduate students and faculty in science, engineering, and mathematics (SEM) disciplines. We firmly believe that a more gender and ethnically diverse faculty will lead to an enhanced learning environment and a higher quality research program. This institutional transformation will be driven by the proposed Center for Institutional Change (CIC). The CIC will focus on leadership development, departmental cultural change, policy transformation, mentoring, and transitional support.

II.   THE NATIONAL CONTEXT

In 1998, the U.S. Congress established the Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development (CAWMSET) [2]. CAWMSET clearly delineates the barriers that exist throughout the science, engineering, and technology (SET) pipeline that deter women from seeking and continuing to be a part of the SET workplace. In the chapter pertaining to professional life, the Commission writes in its final report, *Land of Plenty*:

> In addition to salary, faculty rank and tenure, working conditions contribute a great deal to the degree of satisfaction a worker feels about his or her employment. In turn, satisfaction with working conditions contributes significantly to women faculty's decision to remain at an institution or in academe. Conflicting demands of work and family affect women's ability to function as a professional and as a family member. Is it any wonder that without a sea change in the way women are supported in their SET careers, they will continue to drop out to the diminishment of the nation's knowledge base? [3]

Sonnert's study *Project Access* [4] and Mary Frank Fox's [5] research on productivity have confirmed subtle barriers that, compounded over time, result in major disparities in the career advancement of women and men in academia nationally. Their research indicates that:

- Among younger women in the physical sciences, mathematics, and engineering, the average academic status was almost one full rank below a comparable cohort of men.
- Women experience subtle but noticeable marginalization in the social system of science (e.g., left out of decisions and social gatherings).
- Women of equal stature to men have a slightly lower estimation of self-confidence, ambition, and related traits.
- Family issues (e.g., dual-career couples and tenure vs. the biological clock) tend to impact careers of women more then men.

Thus, small incremental obstacles that slow down the careers of women tend to be much more prominent than clear-cut barriers. These obstacles are both structural and psychological. Our plan combines both institutional transformation and leadership development to address these obstacles.

III.   WOMEN FACULTY IN SEM AT UW: THE CURRENT STATUS

The CIC will work with all departments in the College of Engineering (COE) and with the following nine departments in the College of Arts and Sciences (A&S): applied math, astronomy, atmospheric sciences, chemistry, geological sciences, geophysics, math, physics, and statistics. The COE and nine A&S departments were chosen because 20% or fewer of ladder faculty (tenure-track) are women in these units. Table 1 below shows the number of women SEM ladder faculty in the two colleges.

The College of Engineering at the University of Washington has devoted significant resources to achieving full participation of women, people of color, and the disabled in engineering disciplines. As a result, the percentage of women engineering ladder faculty at UW (13%) surpasses the peer average of 8.5% [6]. The results of these efforts can also be seen in the make-up of the student body. In 1999-2000, 23.7% of the degrees awarded by the College went to women, compared to the national average of 18.6% [7]. The advantage also holds at the master's and doctoral levels: 26.6% vs. 20.3% and 18% vs. 12.3%, respectively.

The diversity of the engineering faculty can be attributed in part to a Faculty Recruitment Toolkit that was developed about four years ago. In a recent year, COE hired 22 faculty, seven of whom were women and two who were African-American. The Toolkit has now been modified for use University-wide and is being used as a model at MIT, UC-Berkeley, Texas A&M, and numerous other campuses. In order to enhance retention, the COE created WEFA, the Women Engineering Faculty Association, which is a monthly networking opportunity for women engineering faculty.

The College has a strong focus on professional development for students, staff, and faculty. New faculty at UW participate in the New Faculty Fellows program, a week-long program in the fall. The COE supplements that with a half-day introduction to resources for new faculty. There are also quarterly workshops for assistant professors on navigating the tenure track, grant-getting, and other topics of interest. This has resulted in numerous young investigator awards. This year, nine COE faculty received the NSF Career Award, and three received the prestigious Sloan Research Fellowship.

The COE currently has a dean, one associate dean, and one department chair who are women, which puts UW in an excellent position to deliver on the promise of an ADVANCE grant.

The College of Arts and Sciences has also made strides to address the representation of women in SEM. The College has created a new hiring initiative to bring in senior women into these departments; two new full professors have been hired in the past two years. Still, there is much work to be done, as can be seen from Table 1.

Table 1: Percentage of Women in Engineering and Science Departments

College of Engineering	Total	Men	Women	Percent Women
Aeronautics & Astronautics	17	17	0	0%
Bioengineering	8	6	2	25%
Chemical Engineering	15	13	2	13%
Civil & Environmental Engineering	30	27	3	10%
Computer Science & Engineering	34	31	3	9%
Electrical Engineering	41	36	5	12%
Industrial Engineering	7	4	3	43%
Materials Science & Engineering	11	9	2	18%
Mechanical Engineering	29	27	2	7%
Technical Communication	10	6	4	40%
TOTAL LADDER FACULTY =	**202**	**176**	**26**	**13%**
College of Arts & Sciences	**Total**	**Men**	**Women**	**Percent Women**
Applied Mathematics	10	9	1	10%
Astronomy	11	9	2	18%
Atmospheric Sciences	14	13	1	7%
Botany	12	9	3	25%
Chemistry	41	37	4	10%
Genetics	13	10	3	23%
Geological Sciences	18	17	1	6%
Geophysics	10	9	1	10%
Mathematics	51	47	4	8%
Physics	46	42	4	9%
Psychology	50	31	19	38%
Speech and Hearing Sciences	12	5	7	58%
Statistics	17	15	2	12%
Zoology	31	22	9	29%
TOTAL LADDER FACULTY =	**336**	**275**	**61**	**18%**

Source: UW Workforce Profile, October 2000

The College of Arts & Sciences has created a Climate and Community Project to address the need to improve departmental climate. Project staff visit each department in the College on a regular basis to discuss best practices for creating a productive working and learning environment for students, staff, and faculty members. In these presentations, department faculty are encouraged to identify elements of the departmental climate and culture that might negatively affect the learning environment and develop strategies to overcome them. The presentation also provides a framework for thinking about issues such as representation, power, and allocation of resources in relation to diversity. The Project website includes research, model programs, and strategies for improving climate and community [8]. We will build on this project as we develop models for department cultural change.

The College of Arts & Sciences has also recently developed and conducted a survey of climate for women faculty emphasizing participation of women in leadership in their fields. These data will be used to inform strategies for increasing the participation of women in leadership in all academic fields, especially in SEM. The College has recently raised external funding to create a Center for Women in Democracy that is developing new models for leadership training that will be applicable to developing leadership capabilities for women in SEM.

The College is also a national leader in the areas of women studies and curriculum transformation. Of particular relevance is the work of Prof. Angela Ginorio (Department of Women Studies), who uses feminist theory to inform practice in science and engineering and the work of Dr. Betty Schmitz (Curriculum Transformation Project Director), who develops best practices and transformation indicators for institutional change. They are both on the Leadership Team for this project.

The University of Washington is a leader nationally in programs focused on enhancing diversity (ethnic, gender, and people with disabilities) among students, staff, and faculty in SEM. We are deeply committed to providing opportunities, access, and a welcoming environment for all who wish to teach or study SEM on the UW campus. This is accomplished in part through the standing committees and diversity programs shown in Table 2 below. DO-IT, MESA, and WiSE have received the Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. The staff in the diversity programs have a wealth of knowledge with respect to creating an environment that allows all to excel in SEM. These efforts position the UW to succeed in this ADVANCE endeavor. The diversity programs have primed the pump, and the proposed efforts will ensure that women move forward into leadership positions in SEM.

Table 2: UW Diversity Committees and Programs

UW Committees	UW Diversity Programs
• The President's Advisory Committee on Women (PACW) [9]	• Disabilities, Opportunities, Internetworking, and Technology (DO-IT) [14]
• Faculty Senate Special Committee on Faculty Women [10]	• Gaining Early Awareness and Readiness for Undergraduate Programs (GEAR-UP) [15]
• Faculty Senate Special Committee on Minority Faculty Affairs [11]	• Math, Engineering, and Science Achievement (MESA) [16]
• President's Task Force on Gay, Bisexual, Lesbian, and Transgender Issues [12]	• Minority Science and Engineering Program (MSEP) [17]
• President's Advisory Committee on Diversity [13]	• UW Science, Technology, Engineering, Mathematics (UW STEM) [18]
	• Women in Science and Engineering (WiSE) [19]

The Office of Minority Affairs (OMA) provides resources and support for underrepresented groups on campus. Dr. Nancy "Rusty" Barceló, currently the Associate Vice President for Multicultural Affairs at the University of Minnesota, will join us on July 1, 2001 as the Vice President of OMA. Dr. Barceló has extensive experience in the diversity arena in academe. Her office will serve as the bridge between the work of the CIC and the central administration to ensure that institutional transformation occurs.

IV.   VISION AND GOALS

In order to plan for this proposal, we convened numerous groups to seek input and guidance. These ranged from small groups of women SEM faculty to large groups of SEM staff and faculty. We also discussed the plans with associate deans and department chairs. A synthesis of the feedback we received yielded the following **top priority areas:** an enlightened leadership in SEM disciplines; a need to change SEM departmental culture to ensure that women faculty are welcomed and their achievements are recognized; examination of UW policies for equity; mentoring of women faculty for leadership opportunities; work/family balance; and dual career partner issues. These areas are consistent with the studies in the literature. We address below our program goals and the performance plan for achieving these goals. The strategy is guided by voices of SEM faculty on this campus to ensure maximum local impact.

We envision a campus in which all SEM departments are thriving, all faculty are properly mentored, and every SEM faculty member is achieving his or her maximum potential. We believe that cultural changes that are designed to help underrepresented groups invariably help all groups and improve the environment for everyone. The programs proposed here fall into this category. We are designing these programs with women SEM faculty in mind, but we plan to offer the programs to all faculty after they are piloted and improved. Our specific goals for this proposal are to:

- Conduct research on issues of importance to women faculty in SEM at UW
- Undertake institutional transformation to enhance the environment for women faculty in SEM
- Support participation by and advancement of women in SEM
- Increase the numbers of women in leadership positions in SEM
- Focus on the diversity among women in SEM and design programs with this diversity in mind

V.   A FRAMEWORK FOR INSTITUTIONAL TRANSFORMATION AT UW

We propose to create a Center for Institutional Change (CIC) to help transform the culture at the UW. The CIC will focus on the implementation of programs designed to eliminate existing barriers and to precipitate cultural change at both the departmental and the institutional level. We believe that it is essential to focus on departmental change because many of the challenges women faculty face have their locus there, in part because of the strong faculty governance culture in academe. We will model the CIC partly on the Center for Engineering Learning and Teaching (CELT). In its third year, CELT is housed in the College of Engineering and focuses on (1) scholarly research in the teaching and learning of engineering and (2) providing resources to faculty who want to innovate in the classroom. The broader goal is to transform the learning environment in the College of Engineering. CELT has made a major impact in a short period of time, and we will use lessons learned from it to design the CIC which will focus on:

A. Leadership development for current chairs and deans in SEM
B. SEM department cultural change
C. Policy transformation
D. Mentoring women in SEM for leadership
E. Transitional Support Program for SEM faculty
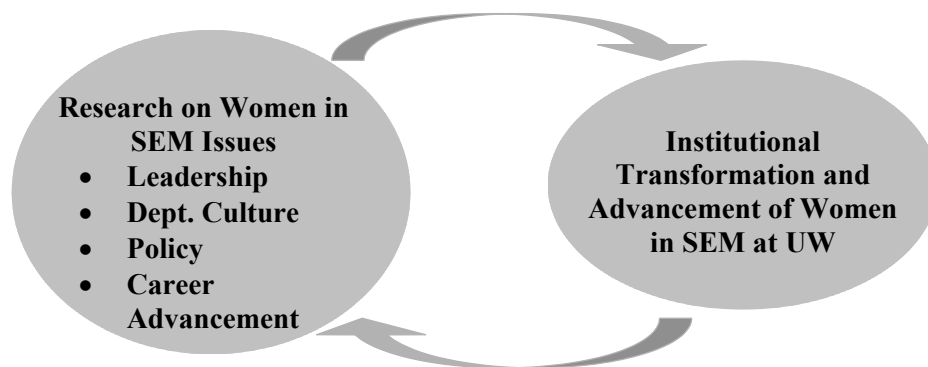
Diagram 1: CIC Model

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Diagram 1 illustrates the CIC model: research on women in SEM informs the implementation of programs to transform the institution. The CIC will conduct research on the impact of the new programs on institutional transformation at UW, and use these data to inform future research and programs.

We recognize that women's issues vary dramatically from woman to woman and across boundaries of class, position, race, ethnicity, sexual orientation, and gender [20]. The CIC will identify the challenges associated with this diversity among women vis-a-vis institutional transformation. We will invite experts in these matters to visit the CIC and work with us on the five focus areas.

Although there are a number of qualified candidates on campus, the CIC director (most likely a faculty member), will be identified through a national search. In addition, the CIC will have 1.5 FTE staff funded for this effort. We are also proposing to have CIC Faculty Scholars who will be dedicated to the CIC work for 1-3 quarters at a time. These scholars, who may be UW faculty or visitors, may be in SEM disciplines or in fields that study SEM workforce issues.

There are linkages between many of these activities, and the CIC team will have responsibility for cross-fertilization of ideas and interactions between project teams. The CIC team will also work with our industrial partners to develop methods for sharing best practices which enhance the environment for women in SEM. Some specifics for each of these programmatic areas follow.

A. Leadership Development for Current Chairs and Deans in SEM

Departmental change to advance the interests of women is unlikely to succeed unless there is intervention from the leadership of the University [21]. In order to provide this leadership, administrators need a solid understanding of the structural, psychological, and behavioral barriers to the advancement of women in SEM and of best practices and strategies at the departmental and institutional level. We will:

- Build understanding and ownership for advancement of women in SEM among current and emerging University leaders
- Educate SEM department chairs, associate chairs, and faculty leaders about issues affecting women
- Develop accountability networks for institutional change to ensure advancement of women in SEM

Each year of the project, we will convene a two-day retreat for senior administrators, SEM department chairs, and senior women in SEM. For this activity, we will invite all SEM departments so that those which have made more progress (above 20% women ladder faculty) can share approaches and strategies with others. Corporate partners will also be invited to the retreats and in turn, leaders in SEM from UW will attend complementary meetings at industrial sites. We will invite nationally known scholars to present: (1) current research on women in SEM that emphasizes the need for cultural change in academic departments and (2) a framework and model for institutional change that departments can use to plan and implement change.

Retreat participants will work together to develop preliminary plans for improving the climate for women, supporting current faculty women in career advancement, and hiring more women faculty members. President McCormick will convene annual meetings to assess progress and accomplishments.

Outcomes of this activity include strong internal networks, a common language and understanding of the barriers to be addressed and how to address them, and a model and materials for leadership development that can be replicated at other institutions.

B. SEM Department Cultural Change

Etzkowitz, Kemelgor and Uzzi recommend the development of "relational departments" [21] in which the culture and structure provide support to all its members and in which faculty, male and female, can wrestle with issues of gender, family concerns, and other obstacles that have affected the entry and persistence in SEM. We will:

- Develop strategic planning processes in each SEM department to increase the participation and career advancement of faculty women
- Develop career advancement plans for each faculty member in the department
- Build collegial relationships within each department that foster the productivity of all its faculty, staff, and students
- Develop transformation indicators to measure participation and advancement of faculty women in SEM fields

The CIC will provide consultants, workshops, and assessment tools to assist departments in assessing their current climates and addressing problem areas. To be effective, support and interventions will be tailored to each department's needs [22]. Departments will analyze their mission, values, and goals documents; codes of professional conduct; decision-making and planning processes; governance structure; formal and informal policy framework; workloads; patterns of resource allocation and faculty support; and informal department culture for disparate impact based on gender. Our corporate partners are also developing strategies for department cultural change. In particular, CH2M HILL has a diversity program in place that works with departments in the organization. We will share best practices in this area.

Based on these reviews, each department will develop a long-range plan to improve its climate, increase the numbers of women faculty members and graduate students, and provide support and advancement opportunities for its women faculty members. Included will be transformation indicators in each of the areas above that will be used to measure success of the plans.

To aid in this process, CIC staff will design a Faculty Retention Toolkit to serve as a guide to department chairs and deans to facilitate the retention and advancement of women faculty. One component of the Retention Toolkit will be professional development plans tailored to each faculty member's needs. Participants at a 1999 COE leadership retreat developed a faculty professional development chart that outlines experiences and activities that benefit the individual faculty member's career growth and personal and professional development. The chart addresses experiences that fall into three categories: those internal to the UW, those that provide external visibility and growth, and those that engender personal development. The CIC will work with SEM department chairs to develop strategies for charting professional growth of individual faculty members in each department.

Outcomes of this activity include: (1) strategic plans for transformation of departmental climate and advancement of women in the field and (2) a model and materials for departmental change that can be disseminated nationally, including a Faculty Retention Toolkit (together with the Faculty Recruitment Toolkit described earlier).

C. Policy Transformation

In order to institutionalize the transformations discussed in this proposal, the UW must incorporate policies specific to the advancement of women in SEM [23]. A strength of our proposal is that policy revisions that we undertake will benefit all faculty members on campus. We will:

- Conduct research on barriers to women in SEM related to policy
- Review current policies
- Work through institutional governance channels to revise current policies and develop new ones that will help advance women faculty members in SEM

The need for policy review is particularly critical in light of the post-affirmative action climate in Washington state since the passage of Initiative 200 (I-200) in 1998. I-200 prohibits preferential treatment based on race, sex, color, ethnicity, or national origin in public employment, education, and contracting. In response to I-200, President McCormick and other University leaders have worked hard to find new ways to foster diversity that are both effective and legal. Answering a request by UW student groups, President McCormick, the Regents, student leaders, and UW administrators signed a Diversity Compact in October 2000 [24].

The CIC will work closely with the President's Advisory Committee on Women and other diversity committees to review current policy and make proposals to appropriate governance bodies. In addition, the CIC will partner with UW's Evans School of Public Affairs and its dean, Marc Lindenberg, to develop policies supporting this effort.

Pay Equity. The CIC will review salary policies for all faculty members, women and men, and recommend revisions to accommodate those faculty who choose to work temporarily at reduced levels at critical transition periods in their personal lives (e.g., having a new child).

Promotion and Tenure Processes. The UW recently revised its Faculty Code to provide the opportunity for each professor to negotiate with her/his chair annually about professional activities to be undertaken. This will have a direct impact on promotion and tenure decisions. The CIC will monitor the impact of this code change and offer recommendations on how to implement the new code in the most equitable way possible.

Dual Career Policy. The phenomenon of dual career partners has emerged as a critical recruitment and retention issue in higher education [25]. UW has responded to the emergence of dual career partners by providing job assistance services to the partners of new employees who also seek faculty or professional positions in the Seattle area. The CIC will work with SEM departments to determine the effectiveness of UW's new dual career policy and the need, if any, for changes to it.

Outcomes of this activity include new and revised policies that support productivity of all faculty members at UW and a model for policy review and revision for other institutions.

D. Mentoring Women in SEM for Leadership

UW will focus on mentoring both women graduate students and women faculty in SEM. It is essential to encourage women graduate students to consider careers in academe [21]. Increasing the presence of women SEM faculty increases the number of role models and mentors and encourages the persistence of graduate women in technical fields [26, 27]. Even some women who have been mentored in graduate school have felt that they often did not receive feedback about their potential to be academics; that they were not given opportunities for scholarly writing and publishing; and that they lacked confidence in their ability to do scholarly research and writing [28]. Sloat maintains that if we expect to and are serious about attracting more women into SEM, we need women faculty role models [29].

Once women join the SEM faculty, understanding exactly what is required to advance can often be problematic. The findings of a study of 430 faculty supported the benefits of mentoring [30]. Others also address the positive influences of senior colleagues mentoring junior faculty [31].

Two of Creamer's four elements in the environment that may assist women to become highly productive scholars are: (1) opportunities for development of skills required for competence in scholarly research,

writing, and publication and (2) a network of collegial relationships within and outside the institution, often through professional associations [32].

It is of interest to note that of the four women deans of engineering at research universities (Duke, Johns Hopkins, Michigan State, and UW), none has served as a department chair. Women frequently pursue non-traditional career paths. Our mentoring programs will be designed with this in mind. At the University of Washington, we will:

- Design and implement a mentoring program for women graduate students to encourage them to pursue academic careers. Formative and summative evaluations will be conducted.

- Host informal social gatherings on campus for SEM graduate women to discuss career/family issues, to which children will be invited. Many UW women graduate students are already concerned about how they will manage a faculty career and children when they graduate.

- Design and implement a mentoring program for junior women faculty mentees and senior faculty mentors. Formative and summative evaluations will be conducted.

- Develop and implement a Senior Leadership Shadowing Program to prepare women to advance into leaderships positions. Senior women faculty will be matched with faculty already in leadership positions in the institution and/or with corporate colleagues in the consortium.

- Educate mentees and mentors; quarterly speakers will provide mentees with skills needed to pursue an academic career, balance a faculty career with family obligations, and understand and navigate tenure track process.

Goals of this activity will be to encourage women graduate students to consider faculty careers in SEM; to help junior women SEM faculty advance to senior positions; and to model a pathway for senior women SEM faculty to advance into leadership positions.

E. Transitional Support Program for SEM Faculty

Balancing career and family is a difficult challenge for SEM faculty members [33]. We will:

- Support outstanding women faculty in SEM while they undergo major transitions in their personal lives
- Maintain continuity in SEM departments for faculty in transition and their colleagues

UW proposes to establish a Transitional Support Program (TSP) for outstanding faculty in the midst of major life transitions, such as the birth or adoption of a child or caring for an elderly parent. The TSP will help these faculty as they deal with the difficult challenges of balancing career and family. Specifically, the Program will provide release time and/or other support for up to three academic quarters for the faculty member while moving through such a transition. Transitions will include:

Child Care. UW policy currently provides a one-year extension of the tenure clock for each new child a professor has during his/her probationary period. We do not, however, have much flexibility regarding paid leave. This can be particularly challenging for women faculty members in SEM who must juggle the responsibilities of caring for an infant while carrying a heavy faculty workload of teaching, research, grant writing, and service activities. It is particularly crucial to retain women who have already proven themselves by winning tenure in academia, in part because they are needed to mentor younger women faculty members. A major transformation is necessary in order for all SEM faculty to view family responsibilities as legitimate reasons for long-term planning of academic careers that involve different levels of commitment to teaching, research, and service depending on external responsibilities.

One of the major impediments to advancement of women in SEM is lack of flexible childcare [34]. There are existing childcare facilities on campus; however, they do not meet the demand. Although ADVANCE

resources are not sufficient to address this need, the CIC will work to better inform SEM faculty about resources for off-campus childcare including drop-in daycare, emergency care, and care for sick children [35].

Elder Care. In addition to caring for young children, many women find themselves simultaneously caring for aging parents. The issues of equitable workload and pay during this period of elder care are not addressed with a single policy or a simple employment practice. The UW has the opportunity of becoming a leader in developing equitable solutions for academic women in the increasingly important arena of combining elder care with professional excellence. Dean Nancy Hooyman of the School of Social Work is a leading scholar in elder care practices and conducts research on family caregivers of older people and women in administration [36-40]. She has agreed to work with us to examine best practices in U.S. institutions which have arisen in disciplines where women have traditionally been at least 50% of the faculty and adapt them to the different demands of SEM.

The Transitional Support Program will be administered by the CIC. The support may be used for release time, conference travel, distance learning, or other needs the faculty member may have. UW's distance learning infrastructure can make careers more manageable for faculty with child care or elder care needs because it provides an excellent opportunity to combine career and family through flexible teaching schedules. The College of Engineering's Education at a Distance for Growth and Excellence (UW/EDGE) Program will serve as the focal point for distance education options. For example, faculty members may choose to prepare a distance learning course prior to an upcoming transition and then teach it from home. EDGE will provide faculty with the following distance learning services:

- Streaming Video
- Self-Assessment Quizzes
- Assignments
- Peer Review
- Distributed Office Hours
- Asynchronous Discussion

Outcomes of this activity include the creation of the TSP for both women and men SEM faculty in transitional periods. Our hypothesis, based on the literature cited herein, is that the majority of demand for this program will come from women faculty. The CIC will study the relative demand for TSP support by gender and ethnicity and determine the effectiveness of the program on female faculty retention and advancement.

VI. ORGANIZATION AND MANAGEMENT PLAN

Leadership Team. The Leadership Team will oversee the project, make budget allocation recommendations, and monitor the performance of the five focus areas of the CIC. The evaluation program will include both formative and summative components. The formative evaluations will be shared with the Leadership Team to provide it with data that it needs to make midcourse corrections as the program evolves.

The Leadership Team will include Dean Denice Denton (COE), Dean David Hodge (Arts and Sciences), Associate Dean Mary Lidstrom (COE), Prof. John Wingfield (Chair of Zoology), Prof. Eve Riskin (Electrical Engineering), Prof. Angela Ginorio (Women Studies), Dr. Betty Schmitz (Director of Curriculum Transformation Project), Dr. Suzanne Brainard (Director of the Center for Workforce Development), the CIC Director, Vice President Nancy "Rusty" Barceló (Office of Minority Affairs), Provost Lee Huntsman and President Richard McCormick. Each of the five foci of the CIC will be led by a member of the Leadership Team.

Dean Denton (PI) is committed to ensuring that this project is successful. She has put into place a strong team in the College of Engineering (ten department chairs and two associate deans) with delegated authority to operate their programs. This is the result of a major restructuring effort that has led to more

streamlined processes and greater efficiencies. This reorganization allows Dean Denton time to focus on ADVANCE.

CIC Team. This team will focus initially on staffing the CIC and working to identify an appropriate director. After this is accomplished, the team will oversee the Center's programs and activities. The team includes Dean Denton, Dr. Brainard, Prof. Eric Stuve (Chair of Chemical Engineering), and Prof. Raj Bordia (Chair of Materials Science and Engineering).

Evaluation. There will be both an internal and external evaluation component as described below. The team will consist of Dr. Suzanne Brainard, a research scientist, and a graduate student (internal) and Dr. Yolanda George and Dr. Shirley Malcom of the American Association for the Advancement of Science (AAAS) working with five additional consultants (external). In addition, our corporate partners have offered to serve as evaluators. Weyerhaeuser will organize this effort of the consortium members.

Communication Strategy. In a complex program such as this, it is essential that excellent lines of communication are maintained between all of the partners. The Leadership Team will meet monthly to discuss project progress and to identify barriers and concerns. This team will also monitor the level and effectiveness of communication pathways. In addition, the Leadership Team will meet with the Evaluation Team regularly to receive intermediate feedback on program progress.

The Internet will be used extensively to ensure that all program participants are kept informed about important developments. There will be a program website that will include introductory information about the program, application materials for transitional accommodations, the Faculty Search Committee Toolkit, the Faculty Retention Toolkit, on-line evaluation materials and databases, and contact information for program personnel.

Logistics. There will be many logistical challenges associated with this program given the myriad workshops and off-site retreats proposed. A full-time program assistant will be required to help with the coordination of these activities and to maintain the website.

Table 3: Timeline and Deliverables

Center for Institutional Change	Y1	Y2	Y3	Y4	Y5
Director Search	███				
Staffing	███				
Leadership Development					
Retreats	★	★	★	★	★
President's Meetings		★	★	★	★
SEM Department Cultural Change					
Strategic Planning	███	███	███	███	███
Faculty Retention Toolkit	███				
Develop Transformation Indicators	███				
Charting Professional Growth		███	███	███	███
Policy Transformation					
Research on UW Policies	███	███	███		
Policy Transformation			███	███	███
Mentoring					
Graduate Students	███	███	███	███	███
Junior Faculty		███	███	███	███
Senior Faculty		███	███	███	███
Transitional Support for Faculty					
Program Implementation	███	███	███	███	███
Distance Learning	███	███	███	███	███

Table 3 outlines the project's timeline and deliverables during the five-year period. The timeline and deliverables for evaluation and assessment are provided in Section VIII and for dissemination in Section IX.

VII. SUSTAINABILITY

The University of Washington is committed to the sustainability of this effort to enhance the numbers of women in leadership positions in SEM. We are about to enter a seven-year, two-billion dollar campaign. Our priorities for the campaign include numerous endowed positions for faculty support. We will dedicate some of these positions to the CIC Faculty Scholar and Transitional Support Programs. We will also work to identify donors who would be interested in endowing the CIC. In addition, the work done by the CIC in the first five years will have a long-term impact, especially with respect to policy transformation, SEM department cultural change, and building leadership capacity.

VIII. EVALUATION AND ASSESSMENT

Self-assessment. The on-campus evaluation team (led by Dr. Brainard) will design a holistic, comprehensive, comparative self-assessment study to examine the climate in SEM for faculty, students, and staff. Coupled with the AAAS external evaluation, the study will provide quality data to assess the immediate and long-term impact of this initiative on the recruitment, retention, and advancement of women faculty. The on-going or formative evaluation will include the following components:

1. Develop a self-assessment tool and procedure, modeled after the recent MIT study [41], to provide baseline data for annual assessment and tracking of several variables:

   - Graduate enrollments and degrees granted, disaggregated by gender, race, and ethnicity
   - Comparable data for men and women faculty on salaries, space allocation, resource distribution, teaching assignments, time in rank, and other variables
   - Interviews and focus groups with women faculty to assess their perceptions of equitable treatment, supportive environment, presence or absence of intellectual networking, and issues with childrearing and childbearing

2. Conduct annual surveys to graduate students in SEM to assess their perceptions of the quality of their graduate experiences and their perceptions about pursuing an academic career. Analyses will be conducted and disaggregated by gender, race, and ethnicity.

Coupled with the evaluations of the individual components for leadership development, department cultural change, policy transformation, mentoring, and the Transitional Support Program, this annual assessment will provide baseline information for measuring the immediate and long-term changes in the recruitment, retention, and advancement of women in SEM.

External Evaluation. The external evaluation will examine annually:

1. Progress towards intended goals and objectives
2. Impact of strategies by departments as well as University-wide impact
3. Intended and unintended results as well as positive and negative results

Evaluators will look for depth and pervasiveness of changes in SEM faculty recruitment, retention, promotion and tenure, and advancement of women into leadership positions within departments and the University. In addition, evaluators will look for evidence of how this initiative impacts (a) faculty research and the SEM community and (b) graduate student retention, graduation, and progression to faculty careers in SEM.

Table 4: From ACE's General Framework for Determining Evidence

	Progress	**Success of Strategies**	**Results**	**Evaluation Methods**
Activities	What activities are different in regards to faculty recruitment, retention, promotion and tenure, and advancement?	What strategies helped to change activities?	What are the results of these changes?	Annual interviews with the leadership team and department chairs and university administrators (referred to as annual interviews)
Outcomes	What changes in faculty numbers or rates have occurred by departments and University-wide? What changes have occurred with students?	What strategies led to changes in key outcomes?	What effect have the changed outcomes created?	Document reviews of accountability data Departmental self-study team reports
Policies	What policies are different?	What strategies were effective in altering policies within departments and University-wide?	What are consequences of these changed policies? Which were intentional or unintentional?	Annual interviews Document reviews
Structures	In what ways have defined roles, relationships, department or institutional structures changed?	What were the most effective strategies to bring about changes?	What are the effects and implications of these changes for daily work and long-term department or institutional changes? On productivity of departments and the University?	Annual interviews Departmental focus groups and site visits Annual interviews with selected tenure-track and tenured faculty (referred to as faculty interviews)
Experiences	In what ways has the department and institutional climate changed? What is the depth of the changes?	Through what strategies was the climate changed?	What are the effects of the new climate on faculty, students, staff, and administrators?	Review of climate surveys Faculty interviews Annual Interviews
Language & Symbols	In what ways has the language about gender and SEM changed?	What strategies worked and did not work to change this language?	What are the implications of these changes?	Annual interviews Faculty interviews Review of climate surveys

The external evaluation group will utilize the *General Framework for Determining Evidence* of institutional change recommended by the American Council on Education Project on Leadership and Institutional Transformation [42]. The six areas of change and the types of evidence to be examined or collected in relation to faculty recruitment, retention, promotion and tenure, advancement, and climate changes in SEM departments are outlined in Table 4 above. Evaluation methods are also indicated in the table. For annual faculty interviews, we will select a random sample of ladder faculty, both female and

male. All internal and external data or evidence collected will be disaggregated for the SEM departments by race/ethnicity, gender within race/ethnicity, and disability.

The entire external evaluation group will participate in annual campus site visits. In preparation for site visits, AAAS staff will prepare an initial report and possible questions utilizing UW-generated reports on the various components of the initiative. The annual campus site visits will include presentations; a combination of focus groups or interviews with the UW Leadership Team; and focus groups and interviews with selected departmental chairs, administrators, ladder faculty, and graduate students.

Utilizing the SEM departmental surveys, nine or ten departments per year will be selected for site visits. The departments selected will include a mix of disciplines and departments that are at varying stages of progress. All departments will participate in initial site visits by Years 1 and 2 and final site visits in Years 4 and 5. Each department will be site-visited by two members of the evaluation group. Each member of the evaluation group will prepare a written report on one or two departments, including information on the overall site visit. In Year 3, departmental site visits will be conducted, if needed.

The external evaluation group will include AAAS senior staff and a team of five SEM post-secondary education research consultants. The AAAS staff will work closely with UW administrators and faculty and staff leaders of the initiative in the design of pre- and post-surveys for components, including climate surveys, departmental self-study, faculty evaluations, professional development activities, and faculty and student accountability data. Data will be collected and analyzed by UW personnel. The Leadership Team and the SEM departments will prepare annual reports.

The annual external evaluation group will present initial findings during the campus visit. AAAS will prepare an annual report with recommendations. Shirley M. Malcom, Head of the AAAS Directorate for Education and Human Resources (EHR) Programs, will serve as lead evaluator and Yolanda S. George, Deputy Director of EHR, will serve as the AAAS liaison to UW. Possible team members include Beatriz Chu Clewell (Urban Institute), Sue Rosser (Georgia Institute of Technology), Daryl Chubin (National Action Council for Minorities in Engineering - NACME), Peter Syverson (Council of Graduate Schools), and Robert Ibbara (University of Wisconsin).

IX.   DISSEMINATION

A comprehensive approach to dissemination will provide an opportunity to share our experiences at the same time as we learn from others. The specific tasks for dissemination include:

- Establish a network of institutions and professional associations that are working on issues, programs, and policies pertaining to recruiting, retaining, and advancing women faculty in SEM. (Year 1)
- Hold annual meetings with this network in conjunction with professional society meetings throughout the five-year period to share best practices and identify areas requiring more work to make systemic change to increase the participation of women faculty in SEM.
- Work with industrial partners (initially Boeing, Weyerhaeuser, CH2M HILL, and REI) to share best practices in effecting cultural change to "warm" the climate for women in SEM. Hold annual meetings with UW leadership and corporate partners to present outcomes.
- Disseminate findings from UW best practices at professional technical society meetings and through organizations such as ASEE, WEPAN, SWE, and AAAS Annual Conferences. The survey, mentoring program, and faculty tool kits will have evaluation results by this time. (Year 2)
- Provide updated information on the research activities of women in SEM to industrial partners. This will facilitate industry's ability to identify women faculty conducting related research in order to provide grants or contracts. (Years 2, 3, and 4)
- Network with other ADVANCE institutions.

X. RESULTS FROM PRIOR NSF SUPPORT

A. Denice Denton

Graduate Teaching Fellows in K-12 Education (http://www.engr.washington.edu/prime/archive/about.html)

a) NSF Award Number 9979496, $1,521,461, January 1, 2000 - December 31, 2002

b) "Graduate Teaching Fellows in K-12 Education," D.D. Denton (PI), UW

c) **Summary of Results:** Partnership for Research in Inquiry-based MSE Education (PRIME) is a partnership between five Seattle-area school districts; three National Science Foundation (NSF) Local Systemic Initiatives; 15 University of Washington (UW) academic departments involved in math, science, and engineering; College of Education faculty; and four UW diversity programs. The focus of this program is inquiry-based learning in SEM education in middle school settings with diverse student and teacher populations. Each year for three consecutive years beginning in the year 2000, 12 UW graduate students are selected as PRIME Fellows to work in a partnership with middle school teachers in the SEM disciplines. The Fellow-teacher partnerships are engaged in curriculum development and research over the course of the year and present their results at a regional showcase at the end of each year.

B. Eve Riskin

POWRE: Strategies to Add Redundancy for Graceful Degradation of Image and Video Quality Over Lossy Packet Networks

a) NSF Award Number 9973531, $75,000, August 1999 - January 2002

b) "POWRE: Strategies to Add Redundancy for Graceful Degradation of Image and Video Quality Over Lossy Packet Networks," E.A. Riskin (PI), UW

c) **Summary of Results:** Under this grant, we are developing unequal loss protection algorithms to assign FEC to progressive data to provide graceful degradation against packet loss for images, video, and speech recognition. Two Ph.D. students are being supported by this grant. Ms. Agnieszka Miguel is working on MD-SPIHT and ways to protect regions of interest from packet loss. Mr. Alexander Mohr developed a new algorithm for FEC assignment that is two orders of magnitude faster than his original hill-climbing algorithm.

d) **Publications:**

Professor Riskin is working with Professor John Parr to revise the publication, *Signals, Systems, and Transforms*, by Phillips and Parr (Prentice Hall Publishers) into a third edition, for publication in 2003.

- Agnieszka C. Miguel and Eve A. Riskin, Protection of Regions of Interest Against Data Loss in a Generalized Multiple Description Framework. *Proc. Data Compression Conference*, p. 562, March 2000.
- Alexander E. Mohr, Eve A. Riskin, and Richard E. Ladner, Unequal Loss Protection: Graceful Degradation of Image Quality Over Packet Erasure Channels through Forward Error Correction. IEEE *Journal of Selected Areas in Communications*, Special Issue on Error-Resilient Image and Video Transmission, 18(6): 819-828, June 2000.
- Alexander E. Mohr, Eve A. Riskin, and Richard E. Ladner, Approximately Optimal Assignment for Unequal Loss Protection. *Proc. of ICIP 2000, vol. 1*, pp. 367-370.
- Eve A. Riskin, Costas Boulis, Scott Otterson, and Mari Ostendorf, Graceful Degradation of Speech Recognition Performance Over Lossy Packet Networks. Submitted to Eurospeech 2001.

C. Suzanne Brainard

Training Mentors: A Transportable Model to Improve Retention of Women in Engineering

a) NSF Award Number HRD-9553430, $100,529, June 1, 1995 - December 30, 1996

b) "Training Mentors: A Transportable Model to Improve Retention of Women in Engineering," S.G. Brainard (PI), UW

c) **Summary of Results:** The primary objective is to design, implement, evaluate and disseminate a comprehensive and standalone Mentoring Training Curriculum for women in engineering (students, faculty, and professionals).

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