The ESCALATE program, in collaboration with the NSF-sponsored ADVANCE program at the University of Michigan, will advance on two fronts — career development and climate change — by developing and implementing nine strategies to improve the advancement of women in academic science and engineering at Wayne State University.

**Project Activities:** We will focus on broad-based institutional change in sciences and engineering, departmental change in two engineering programs, and career development activities for women faculty in sciences and engineering:

**Infusing Institutional Climate Change:** A Resource Team will be formed from applicants interested in learning more about women’s circumstances and strategies for institutional change, as well as willing to work for change on our campus. A UM Theater Group will present interactive workshops to campus leaders that teach about equity in hiring and tenure processes, and about mentoring. WSU will initiate a Joint Urban Presence intended to develop strategies for sharing skills known to be effective working with urban students.

**Departmental Transformation:** Two engineering departments will engage in self-study and develop strategies for increasing women’s numbers and advancement.

**Women’s Career Development Initiatives:** An Annual Women’s Career Symposium will be held where women faculty, advanced graduate students, and post-docs in the sciences and engineering meet to learn about practical solutions to everyday dilemmas, to network with others, and to guide the research team’s efforts. Monthly Career Network Meetings focused on specific issues or disciplines will allow opportunities for women from UM and WSU to network. A Web Resource for Career Advancement will be developed that allows on-line networking of women faculty. Career Development Grants for women faculty in sciences and engineering will provide funds to overcome barriers to career advancement, such as travel to funding agencies, childcare at conferences, and for a speaker to come to the campus. Wider Horizons allows inviting women faculty and others from area colleges and universities to career network meetings, which will spread the networks of women.

The project will be co-directed by Ece Yaprak, an Associate Professor of Engineering Technology, and Karen L. Tonso, an Assistant Professor of Education. In addition, additional project management will come from Allen Batteau, Director of the Institute for Information Technology Cultures, who is the Principal Investigator, and Diane Pawlowski, a Ph.D. Research Associate, who will serve as Evaluation Coordinator. Michele Grimm, Associate Dean of Engineering, will oversee climate change activities in two engineering departments and serve as liaison with administration.

**Intellectual Merit:** Built on a broad base of scholarship, the proposed activities remedy two central concerns: 1) that women become isolated from networks needed for success as scientists and engineers; and 2) that cultures of academic science and engineering are not aware of their impact on women and need transformation to take women’s needs, interests, and desires into account. By explicitly teaching women about the range of experiences that other women report, developing strategies responsive to emerging dilemmas, and connecting women to networks where they can find support for being women and for being better scientists and engineers, the project improves women’s social capital. Also, infusing change at the institutional level in hiring, evaluation, and tenure processes enhances women’s chances of being hired, retained, and making lasting contributions to science and engineering.

**Broader Impacts:** Our efforts explicitly infuse information about women’s circumstances into science and engineering academic settings, which integrates research and education. Through networking efforts, institutional change initiatives, and the Joint Urban Presence, this project takes seriously NSF’s call for diversifying the academic science and engineering workforce. Innovative dissemination strategies and an interdisciplinary approach improve the applicability of findings to a wide range of academic communities.
This proposal to the ADVANCE program of the National Science Foundation establishes **ESCALATE** – a program at Wayne State University, an urban, Carnegie I research university in Detroit, Michigan. **ESCALATE** will improve the experiences and career development of women faculty in the academic sciences and engineering. The **ESCALATE** program, in collaboration with the NSF-sponsored ADVANCE program at the University of Michigan (Grant #0123571), will advance on two fronts – professional capital development and climate change – by developing and implementing nine strategies to improve the advancement of women in academic science and engineering at Wayne State and other Detroit-area institutions. In particular, based on discussions with members of the ADVANCE team at the University of Michigan, we will replicate those strategies that proved most effective, and by continuously comparing our situation to that of the University of Michigan, adapt them to an urban setting.

Wayne State University serves a special role among research universities. Like City University of New York, Cleveland State University, University of Illinois-Chicago, and others, Wayne State draws its students from an area with an enormously diverse population. Not only do some of our students come from circumstances indistinguishable from traditional college applicants, but also students may be recent immigrants, may be developing English language skills, be from socio-economic circumstances that would have earlier precluded college attendance, have families, be older and working full time, and of course those from nearby neighborhoods represent African American ways of life. Thus, attracting and retaining faculty, especially women, who have the talent and flexibility to balance challenging, but very rewarding, teaching situations alongside a research agenda of the sort required at a Research I University, requires special efforts. Improving the chances that women faculty will prosper in their careers can only make the campus stronger. This, then, is our goal – to learn from the University of Michigan’s ADVANCE project and translate it into an urban setting.

In this proposal, we first describe the current situation of women and minorities in science and engineering at Wayne State and compare it to national trends. Second, we situate our project in the research literature and make clear how ADVANCE findings apply to our site. Third, we describe nine partnership-building strategies for personal, collegial, and institutional transformation, making evident partnerships already begun and how they will continue during the project.

A core concept in our program is a measurement-driven approach to program planning and implementation. We describe our evaluation strategies and benchmarks, and how these will feed back into the ongoing program.

A program of the sort that we propose will have very limited value without a firm commitment of institutional support. We describe our strong institutional support and describe how it furthers the dissemination of our results both beyond the immediate target departments (engineering and physical sciences), as well as into other institutions in the Detroit area. We conclude with a description of the broad personal, collegial, institutional, and societal impacts that the **ESCALATE** program will foster.

### A. The current situation at Wayne State

The participation of women in academic science and engineering careers is a critical ingredient in developing and sustaining a diverse and talented scientific and technological workforce in any academic community. In addition to their contributions to the research and scholarship efforts of that community, women faculty also serve as role models for future generations of scientists and engineers who will make up America’s professional workforce for many decades. Overall,
women held only 34.1% of the full-time, tenured or tenure-track, academic appointments at Wayne State in the Fall term of 2005, with women faculty concentrated in a few fields: 90.9% in nursing, 48.6% in education, and 36.8% in the fine and performing arts, on average. This number drops noticeably in science and engineering. For instance, in the College of Engineering, women held only 10.3% of these positions, with 21.7% in biology, 25.9% in chemistry, 5.6% in computer science, none in geology, 5.4% in mathematics, and 7.4% in physics. Only in chemistry do women’s numbers rise to levels exceeding national averages (Handelsman, et al., 2005). (See table below comparing WSU with U.S. Top-50 Programs.) Though there is variation among programs, women’s numbers tend to be lower as rank increases from Assistant to Full Professor. And, to date, we have identified no women serving as Assistant or Associate Deans in academic science departments, and know of no women Chairs.

<table>
<thead>
<tr>
<th>Comparing WSU with US Top 50 Programs</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Full Professor</th>
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<tr>
<td><strong>Biology</strong></td>
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<td>US Top 50</td>
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<tr>
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</tbody>
</table>

Two aspects of women’s representation in engineering are worth noting. First, women’s representation has not changed appreciably since 1999, comprising 8 of 80 in 1999 and 9 of 87 now. Second, women’s representation in engineering subfields varies dramatically (as of Winter 2006). While in some departments, women hold a respectable proportion of these positions (e.g., in BME, the Biomedical
Engineering department which split from Mechanical Engineering; 3 of 6 full-time positions are held by women; in other departments, the statistics are discouraging. For instance, women hold 3 of 14 positions in Chemical Engineering (ChE), 1 of 9 positions in Civil Engineering (CE), and 1 of 7 positions in Engineering Technology (ET). In still other departments, the relative proportion of women to total faculty is even lower. For example in the Electrical and Computer Engineering (ECE) department, there is only one full-time, tenure-track faculty member out of a total of 21, and no women faculty members hold full-time, tenure-track positions in Mechanical Engineering (ME), or in Industrial and Manufacturing Engineering (IME). Not unexpectedly, women’s relative proportion diminishes by rank; of the 9 women in the College of Engineering, only 2 are at the Professor rank, and only one woman serves in a leadership position as an Associate Dean.

These numbers reflect the urgent need for comprehensive and concerted efforts to recruit and professionally advance women faculty in the science and engineering disciplines at Wayne State. And, these efforts require vision, drive, and strategic commitment that may have been limited in the past.

This is not to say that WSU has completely ignored the urgency of this problem. In fact, at least three efforts have focused on addressing this problem in the last decade or so. For example, The President’s Commission on the Status of Women was founded in 1972 to provide a forum for the sharing of concerns that women faculty and administrative personnel experience in the teaching, research, and administrative domains of their professional lives. In the same vein, the Society of Women Engineers founded a chapter on our campus to provide a forum for women engineering students to share their experiences. Most importantly, the WSU Administration actively pursues women for a wide variety of personnel openings, including those for faculty positions. As well-intended as these efforts are, they remain disjointed, do not have as much impact as needed, and fail to create either a rich resource base for women faculty or an expectation of climate change needed to attract and advance women in natural science and engineering disciplines at WSU. Our proposal is a response to this urgent need.

B. Need for new approaches

To improve women’s experiences in academic science and engineering settings and to increase their advancement into leadership positions in academia require approaches that reduce isolation, connect women to social capital, and change departmental and institutional climates (Etzkowitz, Kemelgor, & Uzzi, 2000; Fox, 2003; Hornig, 2003; Kulis, Sicotte, & Collins, 2002; Rosser, 2004; University of Michigan, 2004c). Our proposed initiative advances on two fronts: professional capital improvement and a climate change initiative. Under these two headings are multiple approaches: creating formal and informal networks among women scientists and engineers through monthly meetings, an annual symposium, a web resource, and outreach to other institutions; providing small grants to women science and engineering faculty to help them overcome barriers to career advancement; facilitating the development of a core group of scientists and engineers who will infuse ideas about women’s circumstances into departments; supporting departmental self-study and improvement in engineering; and giving presentations that highlight key biasing practices to campus leadership constituencies. In each instance, our initiative builds on earlier work by the University of Michigan’s ADVANCE Project and emerges from a growing scholarly literature about women in academic science and engineering careers.

As women move through academic science and engineering educational pipelines, their experiences with gender bias accumulate (Clewell & Campbell, 2002; Corley, 2005; Fox, 2001; Kulis, 1998; McIlwee & Robinson, 1992; Nelson & Rogers, 2004; Pattatucci, 1998; Rosser & Lane, 2002; Xie & Shauman, 2003). And, women’s educational traverses have a “cascade effect”:
Impediments to women in science [and engineering] appear at all stages and phases of the scientific career line… Like a series of interconnected circuits, the first member of the chain supplies power to the second, the third and so on. A series of affirming experiences serves to amplify a string of positive effects, until there is a short-circuit and the process is reversed. Women who have avoided negative experiences at an earlier stage often encounter them later. (Etzkowitz et al., p. 133)

Ultimately, women who decide on academic science and engineering careers tend to differ in significant ways from those who do not study at the graduate level or who enter industry workplaces. In fact, “women in [academic] science view themselves as having had prolonged positive experiences and attribute their status and achievement to supportive mentors along the way” (Etzkowitz et al., 2000, p. 133). However, as they apply for jobs, set up labs, and seek tenure, opportunities for negative experiences grow and these impede productivity.

Job searches prove a minefield for women scientists and engineers in academia. Two aspects deserve mention. First, women may defer to a partner’s job interests or otherwise ignore personal considerations (Etzkowitz et al., 2000; Rosser, 2004). And, women scientists and engineers are far more likely to have scientist and engineer partners than are men (Rosser, 2004). This “two-body problem” typically impairs women’s careers by limiting their post-doc and faculty job searches to a narrow geographic location, by requiring that they apply at less prestigious institutions, or by shifting them to a different subfield than their earlier work. Second, searches themselves may encode subtle and not-so-subtle discriminatory practices because perceptions about women’s ability to contribute to academic science and engineering tend to depend on taken-for-granted expectations about women rather than on actual situations (Rosser, 2004; Valian, 1999). For instance, “marriage and children are generally viewed by male faculty members [and women faculty from an earlier time] as impediments to a scientific career for women” (Etzkowitz et al., 2000, p. 34). Thus, women are often faced with having to choose between their careers and their relationships to a greater degree than men, which can diminish their contributions to science and engineering. Educating job search committees about practices biased against women and providing strategies for fair consideration for all applicants have the potential to increase women’s employment in academic science and engineering careers (Stewart, Leveque-Monty, & Malley, 2004; University of Michigan, 2004b, 2004c).

After entering academic careers, women find dual male and female worlds of science (Etzkowitz et al., 2000; Xie & Shauman, 2003). Most academic scientists learn new sets of skills, such as setting up a lab, acquiring funding, attracting doctoral students and post-docs, managing personnel and other aspects of lab sciences, and applying for tenure, from mentors and through informal in-department relations. However, women lack systematic connections to these conduits of information. Isolation from knowledgeable, supportive colleagues in their departments – men and women – can be particularly debilitating for women. Not only do women’s low numbers disconnect them from women who may be facing similar dilemmas, but also a woman faculty member’s specialty likely differs from other members of her department, distancing her from scientists with shared interests (Rosser, 2004; Valian, 1999).

Being connected to other scientists and engineers who are working in one’s area is a critical part of success in academic science and engineering careers because having “social capital” connects scientists and engineers “to the productive resources a person gains through contacts that control critical resources, or creates with another person they have a relationship with…. Like the more familiar concepts of human capital (a person’s talents and know-how) and financial capital, social capital has exchange value [in academic science and engineering communities]” (Etzkowitz et al., 2000, p. 116-117). But, women’s social capital falls behind that of comparably prepared men and can impair women’s productivity (Etzkowitz et al., 2000; Rosser, 2004; Valian, 1999). When lack of connection with the profession is coupled with expectations that a woman become the gender-diversity member of committees, ostensibly
the person others will turn to for advice about how to undo many of the practices women faculty are subjected to on a daily basis, women in academic science and engineering careers are placed in an untenable position, further diverted from science and engineering productivity, and distanced from routines for success (MIT, 1999, 2001; Perna, 2001; Rosser, 2004; Valian, 1999).

Women’s responses to institutional isolation tend to be internalized and to deepen isolation, especially producing a sense that her situation is of her own making. On the one hand, when women’s unmet needs and lack of connections go unnoticed by many colleagues, women feel invisible (Etzkowitz et al., 2000). On the other hand, being women provides all too many opportunities for them to be hypervisible when they ask for advice, make typical new faculty stumbles, and at times act in ways that may conflict with expectations of some old-guard faculty. Such hypervisibility can make women feel vulnerable or see themselves as failures. These kinds of feelings can lead in time to women’s developing a sense that they lack full membership in their scientific community, and produce “a deprecating sense of self-consciousness [that] appears to permeate the scientific female experience,” as well as self-protective behaviors (Etzkowitz et al., 2000, p. 139). Yet, not belonging, being disconnected from colleagues, and coping by becoming self-protective contribute to further isolation, exactly the opposite of what should occur in science where being better connected and taking more risks – not fewer – are associated with making substantive contributions. Facilitating connections among women as they learn more about being academic scientists and engineers – networks that support both women’s extra-academic social roles and their science and engineering work – can diminish isolation and improve social capital (Ferber, 2003; Rees, Amy, Jacobson, & Weistrop, 2000; University of Michigan, 2002, 2004c, nd).

As scientific and engineering research moved beyond that done by individuals and toward multidisciplinary teams housed on several campuses, having interdepartmental and intercampus ties has become critical to success. These connections:

are more likely to exist between persons in different professional circles, thereby becoming bridges over which new ideas flow between two otherwise disconnected research teams that could benefit from one another’s knowledge. Moreover, bridging ties access information widely because they are likely to link local department networks together, and thus provide crucial viaducts to resources in fields like science where knowledge is fragmented and dispersed among many persons. (Etzkowitz et al., 2000, p. 169)

Such ties that act as social capital for researchers also connect scholars to breakthroughs and important papers before they are published, and to other ways to stay abreast of scientific work in one’s field. Conferences, scientific and engineering workshops, and other less formal settings where scientists and engineers gather can serve as important sites for maintaining and creating such connections. Thus, interdepartmental and intercampus networks of women scientists and engineers, support for travel to meet with those in such networks, and other ways of fostering interactions hold potential to improve women’s career development.

Gaining tenure proves difficult for women because of their isolation and because the process is hardly designed with women in mind. Since tenure processes are contextual, depending not only on one’s discipline, but also on one’s type of campus, having regular, timely, and systematic input about the process is crucial to success. Yet, women frequently report a lack of adequate advice, little feedback on progress, and only minor amounts of support from knowledgeable colleagues, and this produces a climate where women must again shift for themselves. In addition, standard seven-year tenure clocks simply do not take into account the realities of women’s lives. Here, women are asked to further sacrifice their relational side to scientific progress. Handling issues like child-bearing and -rearing, or career interruptions, is often left for each woman to sort out (Rosser, 2004). Ultimately, women are expected to choose between being a woman with typical women’s social attachments and responsibilities, or being a
scientist or an engineer. When a woman cannot reconcile the difficulties of trying to do both and opts for leaving an academic career, innovations to science are lost. In fact, though it may seem as if men faculty are one way and women another, or that there is a sameness to women’s experiences in academic science and engineering careers, considerable variation exists and can be traced to the proportion of women in a particular department, as well as to the era when one entered academia (Etzkowitz et al., 2000; Kulis, 1998). Though some argued that circumstances would improve when a “critical mass” gathered, typically more than 15% (Kanter, 1977), others argued for thinking in terms of three divisions: being a “token” (<15%), a “minority” (from 15-60%), or in the “majority” (>60%) (Etzkowitz et al., 2000). Women scientists in programs where they were a “token” had less social support in their departments and fewer productive resources from these relationships, while being a “minority” meant having higher levels of both, and being in the “majority” placed men and women on even footing. However, others caution that simply increasing women’s numbers may not be enough because women can be viewed as a threat to men’s privilege (Rosser, 2004; Yoder, 1991). Thus, increasing women’s numbers at the department level improves women’s chances of academic productivity, but it may not be enough if it comes with backlash from colleagues, suggesting the importance of also changing negative attitudes about women scientists and engineers (University of Michigan, 2002; 2004a; 2004b).

Though a shift in scientific worlds is underway, in some departments many older faculty members remain firmly entrenched in “the way we’ve always done it.” In fact, a woman scientist or engineer could arrive in a department where her best colleagues were among younger men faculty, while older women faculty might be quite resistant to a new order (Etzkowitz et al., 2000; Kulis, 1998). Many younger men faculty also appreciate family-friendly practices and are willing to work toward these. By comparison, women have more to risk when they stray from campus cultural expectations because these behaviors can be interpreted to imply that women are not serious about their careers. Thus, efforts to change attitudes about women’s needs, interests, and desires, instead of living with the expectation that women put up with extra burdens not imposed on men colleagues, can pay dividends in improving women’s circumstances.

Taken together, women’s experiences in academic science and engineering careers suggest the importance of advancing approaches that not only diminish isolation, but also expand women’s connections to networks, and that do not merely teach women how to survive in the situations where they land, but also help more senior man and women academic scientists and engineers develop a keener sense of the complexity of women’s circumstances and infuse strategies to change academic cultures and climates to better support women’s scientific and engineering productivity. Thus, we advance an initiative focused on the College of Engineering (at individual and departmental levels), as well as on scientists and the institutional climate in a more general way.

C. Proposed program and partnerships

The program that we propose has nine elements. Some of these are adaptations of methods that have proven their effectiveness elsewhere, whereas others are developed for the unique situation of an urban research university. An important component of our program is the partnership that we have formed with the University of Michigan. Our partnership will help us transform our institutions through leveraging reciprocal learning.

1. **Infusing Institutional Climate Change:** Three areas will contribute to infusing institutional climate change:

   a. **Resource Team:** A team of men and women in the sciences and engineering will serve as resources for departments and other units seeking to improve their representation of women and
minorities. This element, patterned after the University of Michigan’s STRIDE program, will serve as the brain trust of the **ESCALATE** program. We propose to advertise for interested senior faculty, men and women, and ask applicants to provide evidence of both “high credibility with colleagues” and a history of “car[ing] about issues of diversity in science” (Stewart, et al., 2004, p. 363). This group will provide advice on practices that maximize the likelihood that well-qualified female and minority candidates will be identified, actively recruited, promoted, mentored, and retained at the University and assist us in developing workshops on hiring and career development issues. The Resource Team will work with departments by meeting with chairs, faculty search committees, and other department members involved in recruitment and retention, especially deploying the Theater Group (below). We propose to collaborate with the U of M’s STRIDE program team in conducting workshops directed at faculty and administrators on our campus, learn from them how identification, recruitment, and retention of women faculty can be implemented effectively, and garner their assistance in our efforts to develop Handbooks on faculty recruitment, faculty career development, mentoring, and candidate evaluation.

b. **Theater Group**: The second domain of collaboration is using University of Michigan resources to sensitize Wayne State faculty and administration on women’s issues. The University of Michigan’s ADVANCE Project, funded by the NSF to enhance the institutional climate for the hiring and retention of women faculty in the sciences and engineering, is implementing an innovative, interactive program through its **Center for Research on Teaching and Learning (CRLT)**. In this program, guided by UM’s STRIDE Team, CRLT Players put on sketches for campus leaders on such topics as mentoring, faculty hiring, and the tenure decision process to sensitize faculty to the unique problems that might be faced by women faculty in hiring, evaluation, and tenure processes. A creative aspect of this program is that the sketches are interactive; that is, they encourage audience participation and dialogue with the actors who stay in character during these dialogues. Further, a facilitator who is an expert in women’s issues guides the discussion that follows each sketch and provides research-based advice about the topic the sketch is addressing. We feel that this is a very creative approach to sensitization of faculty and administrative personnel to women’s issues, and propose to employ these Players in developing our own faculty and administrators through at least three sketches. We propose that our Resource Team will guide this aspect and involve Science and Engineering faculty, and administrators such as department chairs and deans in theater presentations on recruitment (“The Faculty Meeting”), mentoring (“Faculty Advising”), and tenure (“The Fence”).

c. **Joint Urban Presence**: Our collaboration with the University of Michigan will involve a fourth initiative aimed at institutional transformation. For example, we propose to collaborate with the U of M in building a Joint Urban Presence. As a leading Carnegie I Research University in an urban setting, WSU is deeply rooted in the Detroit metropolitan area and its multi-ethnic suburbs. As faculty teaching in this urban setting, we are embedded in the Detroit community, whether in the arts, commerce, the delivery of health care and engineering services, or legal affairs. Serving students of this community, we are experienced in the recruitment, enrichment, and retention of students representing a wide diversity of ethnic and educational backgrounds. Realizing the richness present in such a pool of resources, the University of Michigan founded a Detroit Center at Orchestra Hall in 2005 to provide a physical home for its programs and expand its involvement more deeply within the Detroit community. Given this natural match between WSU’s competencies and experience in urban education and U of M’s mission to expand its involvement in Detroit’s metropolitan environment, we propose to create a joint presence in Detroit and help develop U of M’s faculty and administrative personnel in the delivery of educational programs in an urban setting. We hope to accomplish this in at least three ways. First, we propose to help the UM recruit women students for graduate/doctoral programs from our ethnically diverse student pool, especially in the sciences and engineering, such as those in our McNair Program. Second,
we propose to create a Faculty Development Workshop offered to U of M faculty and other personnel to sensitize them to the special needs of urban women students, and help them further develop and nurture under-prepared graduate students (who are products of such environments) to become more competent in the pursuit and completion of graduate study. Finally, we propose to develop a Handbook of Faculty Development in an Urban Setting to document our current knowledge and joint experiences in this area.

In addition to these initiatives, we propose the following initiatives for departmental and career development initiatives.

2. **Departmental Transformation**: We will offer incentive grants totaling $30,000 for self-study and departmental improvement, tentatively in Industrial and Manufacturing Engineering and Mechanical Engineering, with the possibility of adding a third department. When these are awarded, each department will work closely with the Resource Team (#1 above) to evaluate its climate and implement specific methods to become more supportive of women’s career development.

3. **Women’s Career Development Initiatives**: Finally, we will offer opportunities for women academic scientists and engineers to learn more about women’s experiences in academic careers, strategies for resolving dilemmas, and develop connections with other women and with scientists and engineers in their fields.

   a. **The Annual Women’s and Minorities Career Symposium**: This event will offer presentations about the experiences of women in academic sciences and engineering. This showcase event will be an annual banquet for WSU and University of Michigan women science and engineering faculty that provides a forum to discuss dilemmas, make contacts, and exchange research interests and ideas. Each banquet will include participation by a senior-level officer of the university (dean, vice president, or university president).

   b. **Career Network Meetings**: This will be a set of open meetings for WSU and UM women faculty for program participants to develop connections both on campus and with similarly situated colleagues at other campuses.

   c. **The Web Resource for Career Advancement**: This will be a web site with both open (to the public) and closed (password protected) areas for sharing research interests, accomplishments, career challenges, and opportunities.

   d. **Career Development Grants**: These will be small grants to WSU women faculty, ranging from $500 to $2,000 (total of $46,000 in three years), for assistance with critical career steps: meetings with funding agencies, attendance at conferences, childcare at conferences, or bringing in speakers/colleagues of special interest.

   e. **Wider Horizons**: Within southeastern Michigan, other universities and colleges offering graduate and undergraduate programs and institutions bachelor’s degrees employ women scientists and engineers in academic careers. Anecdotal information suggests that the status of women and minorities in these institutions is similar to that at Wayne State. To widen the career horizons not only of women at the two partnering institutions but also throughout the region, we will extend an invitation to our Career Network meetings and Career Symposium to faculty from area institutions.
The schedule for implementing each of these activities is:

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<td>43</td>
<td>Career symposia</td>
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<td>47</td>
<td>Dissemination workshop</td>
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D. Evaluation, benchmarks and implementation

The proposed *ESCALATE* seeks to improve women’s networks of resources, transform two departments, and begin to infuse change at the institutional level. Each of the project initiatives will be evaluated to understand to what extent it contributes to women’s career development in academic science and engineering.

**Climate Survey:** We will administer an adapted version of UM’s climate survey, *Michigan Survey of Academic Climate and Activities* (University of Michigan, 2002), in the first and last years of the project to establish a baseline needed for understanding the current climate at Wayne State University and develop responses to it, appreciate the impact of the project, and draw comparisons to circumstances at University of Michigan. By adapting the original instrument, this web-based survey will take Wayne State’s unique situation into account. We will distribute the survey to all women tenure and tenure-track, research, clinical, and part-time faculty in the College of Engineering and in science departments of the College of Liberal Arts and Sciences, as well as to a stratified sample of men faculty in similar positions.

In addition, we will perform these tasks to understand the impact of the other initiatives:

1. **Infusing Institutional Climate Change:**

   **Resource Team, Theater Group, and Joint Urban Presence:** Changes in the institutional climate may be most visible in those directly participating in project activities. Thus, paper-and-pencil surveys will be administered prior to starting all presentations or projects, and again at completion of the activity or presentation.

   **a. Resource Team**

   Specifically, assessment of the Resource Team members will begin by administering a survey when an individual at Wayne commits to joining the team. Then, surveys will be administered at midpoint and at the end of the funding period. In the final six months, selected members of the Resource Team will be invited to participate in open-ended interviews focusing on identifying climate change and barriers to this change. As this Team will have wide-ranging contacts and influence, they will be the most effective barometer of the cultural factors at play in institutional decision-making. After the Handbook on faculty recruitment is developed and distributed, the project will document the new hires and promotion actions that occur, surveying relevant members of hiring departments to evaluate the Handbook and improve it.
b. Theater Group
To study the effectiveness of the interactive Theater Group workshops and other events targeting senior faculty and department chairs, we propose using a small focus group of 10 individuals to tease out the effectiveness and/or resistance to attitudinal and cultural change. As the Theater Group presentations are interactive, a focus group would continue discussion begun in the workshops, and allow participants in the assessment to explore topics more fully. It is thus hoped that the assessment process itself will, in this project, reinforce the cultural change goals of the project.

c. Joint Urban Presence:
Pre- and post-test surveys prior to and following the Faculty Competence Development Workshops for U of M faculty and graduate instructors will assess learning about teaching strategies achieved via this avenue. In addition, during these workshops, observations will be undertaken to document the concerns and issues raised in these sessions. Open-ended interviews with Urban Presence team members will document this aspect. Also, documenting establishment of a Wayne State student pool of applicants to UM graduate programs will measure success or failure in this aspect of the Joint Urban Presence.

2. Departmental Transformation: As departments are awarded incentive grants during the project for self-study and improvement, all faculty and staff in that department will be surveyed at the time of the award, and at the end of the project. In addition, selected faculty in these departments will be interviewed at the end of the project to discuss departmental climate issues related to women’s career development and how these might have changed.

3. Women’s Career Development Initiatives
a. The Annual Women’s Career Symposium:
This event presents an opportunity for ethnographic observation as women from two academic cultures compare experiences at an informal level. In this forum, observers can document what happens when women faculty and upper level graduate students in academic sciences and engineering (from WSU and UM) exchange their life trajectories, and discuss dilemmas, research interests, and ideas. In addition, brief open-ended response items on a paper-and-pencil task will provide the project team with overall project direction and give feedback on each event.

b. Career Network Meetings:
At the conclusion of these open meetings, participants will complete brief evaluation surveys. At the conclusion of the project, selected participants who participated in the Career Symposium and the Network Meetings will be invited to participate in more extensive, in-depth interviews about these meetings’ impact on their work lives and careers.

c. The Web Resource for Career Advancement:
An on-line survey will allow participants to evaluate the site and provide feedback.

d. Career Development Grants:
Recipients of small grants will be expected to write a report describing their use of funds, how it impacted their career development, and to discuss its contribution to their advancement (publication, meeting attendance, etc.). A focused group interview in year three will gather qualitative data about grant activities and longer-term impacts.

e. Wider Horizons:
We will collect on-site pencil-and-paper surveys from faculty and graduate students attending Career Network Meetings and Symposia from other colleges and universities. Surveys will focus on what they learned at the event and how it might impact their own career development, and their efforts to encourage climate changes on their campuses. These data would thus identify needs of women at other institutions and expand ESCALATE beyond Wayne State’s campus. In addition, our efforts...
would promote women faculty’s forming inter-institutional alliances and networks.

E. Institutional support and dissemination

1. Institutional support

As evidenced by support letters from the Provost, Engineering Dean Ralph Kummler, Liberal Arts and Sciences Dean Robert L. Thomas, and five engineering department chairs (including letters from two departments with no women faculty) and two science department chairs (both with fewer women faculty than national averages), Wayne State University is firmly behind the ESCALATE project. In addition to these expressions of moral support, we expect this support to take more tangible forms:

- Highest-level officials in the university hosting our annual banquet
- Open access to target departments to promote the climate change initiative
- Identification and nomination of senior-level, influential faculty to serve on the Resource Team
- Ongoing consultation with senior-level officials on the progress of the program

In promoting cultural change, such visible actions can frequently exert more leverage than financial commitments. Faculty will see support for ESCALATE from faculty and administrators at all levels. Visibility and leadership are key components of cultural change (Batteau, 1999). Although words must ultimately be backed by deeds, and “show me the money” is sometimes a touchstone of commitment, the mechanisms that we are creating and that the university is clearly supporting will create a forum for leadership on these issues at Wayne State. The university’s ongoing commitments to this project — in the form of faculty time to lead this effort and serve on the Resource Team, expertise in designing the cultural change program, and facilities at the Institute for Information Technology and Cultures for project support — are already substantial. Financial support from NSF will crystallize these commitments into effective and ongoing cultural change.

2. Dissemination Plan.

Our dissemination plan includes creating several Handbooks for use on campus, as well as discussions at local seminars, traditional papers presented at conferences and in journals, and a workshop for faculty and administrators from area colleges and universities.

Central to the success of our project is using the climate survey and other findings to adapt Handbooks for Mentoring, Hiring, and the Tenure Process - such as those created at UM, as well as creating a Handbook of Faculty Development in an Urban Setting. The Resource Team will have primary responsibility for adapting the first three early in the first year of the project and for deploying these three in their work with Deans, Department Chairs, and Hiring and Tenure Committees. A draft of the Urban Faculty Development Handbook will result from the work of Urban Faculty Development Team and it will be finalized after the second-year Urban Faculty Development Workshop. All will be published on the project website.

Throughout the life of the project, members of the project team will give paper presentations at local, regional, and national conferences and submit articles to peer-reviewed journals. First, at the local level, as part of the partnership with University of Michigan, we will participate in seminars and colloquia at Wayne State University and University of Michigan in science departments in Colleges of Liberal Arts and Science and in Colleges of Engineering. Second, we will present findings at regional and national conferences aimed at issues of higher education, women’s issues, and engineering education. For instance, Dr. Yaprap regularly attends Frontiers in Education (organized by a consortium engineering education entities), and both regional and national American Society of Engineering Education conferences; Dr. Tonso attends ASEE, Women in Engineering Program Advocates Network, and American Educational Research Association conferences; and Drs. Batteau and Pawlowski attend
American Anthropological Association conferences. As our findings mature, we will develop journal articles for publication, such as in *Journal of Women and Minorities in Science and Engineering, Research in Higher Education, Human Organizational, Journal of Engineering Education, The Journal of Higher Education,* and *Recruitment and Retention in Higher Education.*

In the final year of the project, we will organize a workshop for area colleges and universities that presents information about women’s circumstances in academic science and engineering in an urban context, as well as ideas about working with and retaining urban students, especially at the graduate level. Here, participants will develop an understanding of the importance of women’s participation in higher education in science and engineering disciplines and ways to improve academic life through institutional and departmental change, as well as learn techniques for recruiting and retaining students from urban areas, and teaching in urban contexts. These ideas will be archived on the project website.

**F. Broad personal, collegial, institutional, and societal impacts**

Within the scope of the modest program proposed here, this project integrates research and education on our campus. Though social scientists reported widely applicable scientific findings about the difficult circumstances of women in academic sciences and engineering during the 1990s, little of this information reached physical scientists and engineers in academic careers. Our efforts explicitly infuse information about women’s circumstances into science and engineering academic settings. We will follow the advice of the research literature and earlier NSF-funded projects like ADVANCE at UM, which require not only that women become better connected to networks that provide social capital critical to being successful, but also that departmental and institutional climates change. In particular, we anticipate that – as UM found – having a Resource Team composed of insiders lends credence to social science research findings and speeds its acceptance by other scientists and engineers.

In addition, our project will broaden the participation of underrepresented groups. Because the program will be implemented on an urban campus, racial, ethnic, and socioeconomic diversity will exist among participants. Through networking efforts, institutional change initiatives, and the Joint Urban Presence, this project takes seriously NSF’s call for diversifying the academic science and engineering workforce. Opportunities for networking among women faculty, advanced graduate students, and post-docs enhance mentoring opportunities by connecting women with similar interests to one another. Having a space devoted to women scientists and engineers, a place that takes their needs, interest, and desires seriously, and can anticipate next steps in hiring and tenure processes, has the potential to empower women and make more evident that many have knowledge about their careers from which others can learn. Also, the Joint Urban Presence advances the careers of students underrepresented in higher education, as well as helps emerging scholar-teachers among advanced graduate students and post-docs become better educators of these students, potentially improving the academic experiences and retention of underrepresented groups.

Finally, one of the central aims of PAID proposals is to build on earlier ADVANCE efforts and to disseminate results widely. Because we began with those aspects of UM’s ADVANCE project that they found the most productive and because we are adapting these strategies to an urban setting, the project extends the reach of ADVANCE projects. Our project will be strengthened via on-going collaboration with UM and explicit comparison of circumstances between WSU with UM, and through the dissemination workshop that will share our results with other colleges and universities in the area. Also, the team assembled for this project includes three social scientists with a proven track record of making substantive contributions to scholarship and to widely disseminating findings from their research to practitioners. Having this expertise melded to colleagues from engineering enhances the likelihood of acceptance of disseminated materials among science and engineering faculty.