PROJECT DESCRIPTION

Three years ago, no less than the president of Harvard University, Lawrence H. Summers, demonstrated that instances of sexist prejudice and blatant discrimination can and do continue to occur in the academic environment (Goltz, 2005; Kaminski, 2005; Myers, 2005; Probert, 2005, Valian, 2005). More insidious and broad-reaching in its effects, however, is the interlocking set of structural, cultural, and environmental factors that produce disproportionately detrimental outcomes for women in terms of attracting them to academic positions, retaining them as faculty, and promoting their advancement to leadership positions (Bagihole & Goode, 2001; Rosser, 2000).

Patterns of bias can be diffuse and individual incidents may go unacknowledged or be perceived as business as usual. Their pervasive and persistent nature take a toll on morale, performance, and ultimately, willingness to continue working within the academic setting. Some problems, such as work-family balance, are generally acknowledged (Brough et al., 2005; Keene & Reynolds, 2005). Others, such as a sexist cartoon in the coffee room, may seem minor and occasional. Still others, such as gender bias in salary increases, may even go undetected when they initially occur, although the effects are substantial over the course of a career. Cumulatively these incidents take a considerable toll, particularly in conjunction with other stressors of daily life (Klonoff & Landrine, 1995; Swim et al., 2001).

The purpose of this proposal is to adapt, implement, and disseminate a brief workshop activity for educating individuals about the sources and cumulative effects of subtle gender bias. The activity is designed meet three core learning objectives, namely for participants to (1) recognize the negative impact of the accumulation of apparently minor biases and unfair practices on women's ability to advance in their field, (2) develop awareness that different gender-relevant factors may be more significant at one stage in work life than in others, and (3) recognize that patterns, not single incidents, are the most visible indicators of gender inequity in the workplace. Elements of the activity allow for direct comparison of gender-specific realities in the academic work environment. The activity is self-contained, takes about one hour to complete, and does not require special skills of the facilitator.

The proposed project will focus on the workshop activity's adaptation to the academic STEM context and its use in conjunction with existing training programs designed to educate faculty and administrators about the existence and operation of schemas that underlie inadvertent gender bias. Specifically, we use and evaluate the activity as an experiential learning enhancement to information-based on-line resources (e.g., University of Michigan's STRIDE Faculty Recruitment Workshop Presentation). Experiential learning has demonstrated effectiveness (e.g., Cantor, 1997; Springer, Stann, & Donovan, 1997), but proven methods that have been developed in connection with ADVANCE IT programs (e.g., the CRLT Players' interactive sketches) are often costly to implement. The proposed workshop activity offers a brief, economical, data-based, and easy to administer alternative that retains the advantages of experiential learning.

The framework for our approach is derived from current educational research which shows that to develop competence in an area of inquiry, the learner must not only have a foundation of factual knowledge, but understand facts and ideas in the context of a conceptual framework and organize knowledge in ways that facilitate retrieval and application (Bransford, Brown, & Cocking, 2000). Our primary target audience includes peer decision makers (e.g., search committee members; faculty involved in promotion and tenure; department chairs), administrators, and other human resources staff with responsibilities relevant to faculty recruitment, advancement, and retention.

Research has demonstrated the benefits of a range of interventions which are concerned with revealing the processes of subtle bias and identifying practices to minimize bias which has been the foundation of some highly successful IT-developed programs. Two examples are Georgia Tech's ADEPT program which uses case studies and various forms of reference material relevant to promotion and tenure evaluations to assist users in identifying forms of bias in evaluation processes, or University of Washington's LEAD, a series of national leadership workshops for department chairs, deans and emerging leaders in STEM fields. Increasingly, time and budget constraints bring attention to the need for targeted and/or brief programs, as in the proposed project. "Speed mentoring" hour-long workshops in which junior faculty individually consult with each of four senior colleagues (cited in Hadelsman et al., 2005) and travel grants linked to a networking project on which the grantee reports back to peers on her experience (Women in Cognitive Science ADVANCE Leadership project) are just two examples.

Training about unconscious biases by itself does not correct organizational sexism (Kalev, Dobbin & Kelly, 2006), yet without an understanding of how these biases operate and exert their influence, more explicit interventions (e.g., reducing the isolation of individuals who are the only one or two members of their demographic group in a given unit) have more difficulty in getting the buy-in needed to succeed in changing the work environment. Thus, it is important to make education about unconscious bias as effective and efficient as possible so that limited resources can be applied to intervention programs for which it is difficult to reduce costs.

This proposal meshes with the aims of PAID in using a creative method to deliver well-documented, empirically-based information in a brief and interactive format. The proposal fits, too, with the goal of building on successful IT products and devising ways to disseminate them in diverse academic settings without loss of impact and effectiveness.

University Structure

The Pennsylvania State University functions as "one University, geographically dispersed," which is a unique organizational structure in the U.S. Penn State is a major research university that serves approximately 90,000 students and employs over 5500 full-time faculty at 24 campuses distributed across the state. These campuses include the University Park (UP) campus which operates as a central administrative campus, offers comprehensive bachelor's and graduate degree programs, and conducts intensive, highly-ranked research. Five of the campuses are stand-alone colleges which function as liberal arts colleges, each organized with a school division structure (rather than departments), which scatters STEM faculty across different thematic or functional disciplinary areas. Fourteen campuses comprise the University College (UC) which offers a small number of general BA and/or BS degrees. Most students at these 14 campuses complete 2 years at the campus and 2 years at University Park or a stand-alone college. The Office of the Vice President for Commonwealth Campuses (CC) has responsibility for all 19 campuses. The remaining four campuses are specialized institutions that focus on technology, law, medicine, and graduate and professional studies. The University is accredited as one University by the Middle States Accreditation Commission, has one governing Board of Trustees that establishes policy for all campus locations, has one Faculty Senate that shares governance on academic matters and approves all curriculum, and one administration that serves all campuses. At the UP campus, the science, technology, engineering and mathematics (STEM) disciplines are represented primarily in five colleges: College of Engineering (COE), Eberly College of Science (ECOS), College of Earth and Mineral Sciences (EMS), College of Agricultural Sciences (AgSci) and College of Information Sciences and Technology (IST).

The Penn State distributed campus structure offers a unique opportunity to adapt the workshop activity to and evaluate it in multiple settings: in a large Research 1 environment, in smaller rural

and urban environments, and on campuses that offer a range of baccalaureate and graduate degrees, professional degrees, or technology degrees.

Penn State also has a culture of faculty leadership and means for institutional dissemination that is well established.Thus, Penn State is in good position to take advantage of PAID activity. Penn State has established many of the policies, practices, and programs that other institutions have developed through their IT grants. Penn State has demonstrated commitment to efforts to promote gender and ethnic diversity in the faculty. Yet most STEM departments lag behind their goals. Penn State has many policies in place and has previously shown commitment to recruitment, advancement, and retention of women and other underrepresented groups; however, STEM women faculty are concentrated in the lower ranks and express greater dissatisfaction with Penn State in exit interviews. Penn State has been a leader in the development of initiatives in leadership training, stop-the-clock policies, dual hires and family policy, but knowledge about these programs is not widely shared nor is their use uniformly encouraged across the University. In sum, Penn State is on a continuum of development that is ahead of many other similarly ranked institutions and the appropriate policies are in place. What needs to happen is creation of an institutional climate where the basis for these policies is understood as is the importance of their application.

The proposed project, with the support of the university's Vice Provost for Academic Affairs is an important step in moving Penn State toward making the link between establishing good policy and having follow-through. Research has shown that effective follow-through takes the form of training faculty and administrative leaders as to why the policies are important and what individual decision-makers must understand and do to realize the full potential of those policies (Eckel & Kezar, 2003; Eckel, Green & Hill, 2001). As other ADVANCE institutions have shown, revealing the nature, power, and persistence of stereotypes and unconscious biases, is a critical foundation for wise and effective implementation of policies and procedures that in turn transform campus climate and foster diversity within faculty and administrative structures.

Collection of the NSF statistical metrics in the course of preparing an ADVANCE Institutional Transformation proposal informs us that women STEM faculty at Penn State are concentrated in the lower ranks at all campuses. In addition: Penn State women are less likely to be in tenured/tenure track positions at the Commonwealth Campuses (CC) compared to the UP Campus; women are promoted to Full Professor at lower rates than their male colleagues; and are rare in senior academic and administrative leadership positions. The percentage of underrepresented minority (URM) faculty at the non-UP campuses (12.5%) is below that at University Park (16.5%).

ADVANCE efforts emphasize peer-training. For example, U. of Washington ADVANCE program held quarterly chairs' meetings designed and delivered by UW chairs (Yen et al., 2004). Other ADVANCE institutions have since replicated this model (e.g., New Mexico State; U. of Missouri). The proposed project builds upon the successes of these strategies as it adds to contributing to the development of a university culture that aims to rectify current gender inequity and promote a culture of self-reflection in striving to maintain gender and ethnic equity as central institutional goals.

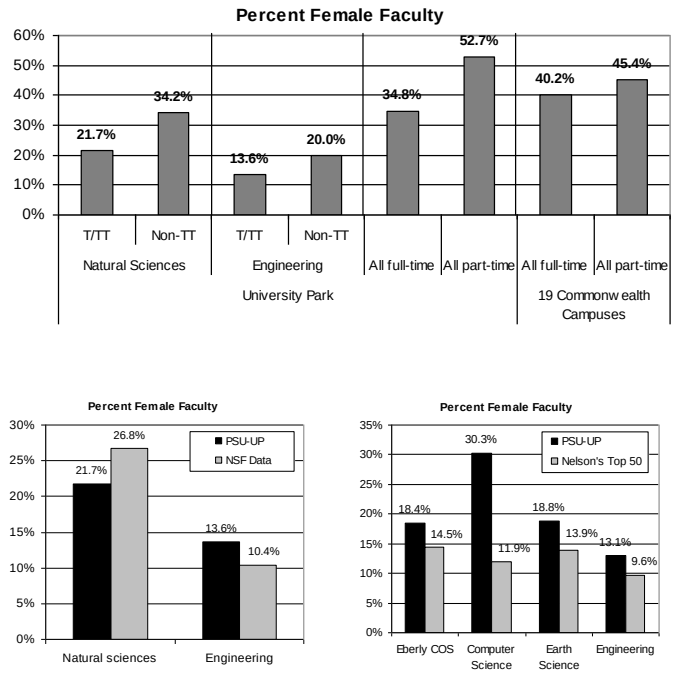
Data on the Status of Women Faculty at Penn State

The status of women faculty at Penn State is complex. Key indicator data for STEM faculty at UP are used to answer four key questions about the status of women (Frehill et al. 2005). We collected and analyzed Office of Institutional Planning and Assessment (OIPA) studies of salaries, tenure rates, and exit surveys of faculty; an informal mentoring survey sent to department heads/chairs/directors; and National data from NSF 2007 (Table H-25) and Nelson (2007).

Question 1: To what extent are women in positions similar to those of men?
The number and percentage of women in STEM departments at UP reveals the following key findings:

- Female faculty are more concentrated in the lower ranks, with proportionately fewer female faculty in the distinguished professor and chaired professor ranks.
- Women comprised 20-35% of the new faculty hired in STEM departments.
- Women comprise 12-27% of the tenured associate professors in the five STEM colleges.

The top panel of Figure 1 shows the overall representation of women faculty in UP natural sciences and engineering and women's representation among full-time and part-time faculty at the UP and the 19 CC. Women are less likely to be in tenured/tenure track than in non-tenure track positions and are more likely to be part-time than full-time faculty. Women are least well-represented among engineering tenured and tenure track faculty at UP campus; however, as shown in the lower two graphs, women are better represented among the tenured and tenure-track faculty at Penn State's UP campus than in comparable engineering faculty positions nationwide. The bottom right panel compares several aggregated fields at UP to those in Nelson's recent report on the "Top 50" departments, which represents an expanded peer-group for Penn State's highly regarded programs. In each of the four sets of disciplinary areas shown in the chart, Penn State shows a higher representation of women than in these comparable "Top 50" departments.



Notes: "Natural Sciences" includes all of ECOS, EMS, IST and AgSci so that the category includes fields comparable to those defined as the aggregate of "Life Sciences," "Physical Sciences," "Geosciences," and "Mathematics and Computer Sciences" by NSF publications. In the lower right graph, "Earth Science" includes only Penn State's Geosciences Department; "Computer Science" includes IST; and "Engineering" includes only the same four departments as were included in Nelson's analysis (Civil, Chemical, Electrical, and Mechanical)

Figure 1. Comparative Data: Women Faculty

Question 2. To what extent are advancement processes equitable for men and women?
Penn State is one of only a handful of institutions that has actually computed and publicized attrition rates of untenured junior faculty (Dooris & Guidos 2006). Key findings from the Penn State institutional data showed:

- The average time in rank for men was significantly longer than for the women, perhaps because the average female associate professor achieved that rank more recently than her male colleagues.
- Women were promoted to full professor at lower rates than their male colleagues.
- Although there is a narrow sex gap in engineering, in all of the STEM colleges, among those faculty who entered Penn State as assistant professors in 1997-1999, women were less likely than men to earn tenure by 2006 (see Table 1).

Table 1. Average Tenure Rates for Assistant Professors Starting in 1997, 1998, and 1999

	COE	ECOS	AgSci	EMS	CC	All PSU
Female	86%	25%	78%	50%	53%	54%
Male	88%	70%	90%	69%	53%	63%
Number	33	31	38	18	152	515

Penn State OIPA report: 2002-2006 on all associate professors indicated that:

- Average time spent in rank was 6.7 years but varied by gender, minority status and campus.
- **Women** associate professors spent a shorter average time in rank (6 years vs. males' 8 years) but were promoted at lower rates than their male colleagues.
- **Minority** associate professors (includes both sexes and Asians) spent a shorter average time in rank (5.2 years vs. non-minorities' 7 years) and were promoted at higher rates than non-minorities.
- **UP** associate professors spent a shorter average time in rank (6.1 years vs. 7.6-8 years) and were promoted at higher rates than their CC colleagues.
- If associate professors were not promoted within the first 6-7 years, likelihood of promotion gradually diminished, with only a small fraction being promoted after 12 years in rank.

Question 3. To what extent are women represented among key decision makers?
Table 2 shows the unequal distribution of men and women in STEM academic and administrative leadership positions. The one notable exception is that even though women account for only 13.6% of Penn State's engineering faculty, they account for 25% of Penn State's members in the National Academy of Engineering.

Table 2. STEM Leadership by Gender

Administrative leadership (STEM)				**Academic leadership (STEM)**			
	M	W	%W		M	W	%W
Dean	5	0	0%	Named professorships	44	3	6%
Associate Dean	11	4	27%	Chaired professorships	49	7	13%
Assistant Dean (drawn from faculty ranks)	1	2	67%	Distinguished professorships	31	2	6%
Dept. Head or Chair	31	5	14%	National Academy of Science members	10	1	9%
Assoc. Dept. Head or Chair	20	4	17%	National Academy of Engineering members	3	1	25%
Professor-in-Charge (academic programs)	8	1	11%	National Academy of Medicine members	1	0	0%

Institute director	13	2	13%	Fellows of the Royal Society	5	0	0%

Question 4. To what extent does gender affect distribution of institutional resources? Analyses of OIPA reports and data about space allocation, salaries, and start-up packages found:

- there were no meaningful differences in salaries between men and women at present;
- men tended to have slightly more square feet of space than women; and
- there were larger variations across units in the gender gap in start-up packages. In ECOS, women had slightly higher-valued start-up packages ($439,000) than men ($407,000) while in AgSci, women's start-up packages were half the size of men's.

These analyses relied upon limited data and need additional research with more careful controls as detailed in the ADVANCE "Toolkit" (Frehill et al 2005).

Materials to be Adapted and Implemented and Proposed Activities

The project entails adapting, implementing, and disseminating an interactive workshop activity for educating individuals about the power and patterns of subtle gender inequities in the workplace, especially those that can lead to decreased representation of women in academic STEM fields. The proposed project has three components. First, we will adapt a workshop activity that has been successfully used in graduate and undergraduate classroom contexts for about eight years to the STEM academic context. Second, we will implement it and evaluate its effectiveness in faculty leadership training in four distinct academic contexts throughout Penn State: Major research campus (UP), graduate studies campus (Penn State-Harrisburg), four-year liberal arts college context (Penn State Erie-The Behrend College), and small enrollment regional campuses (UC system). Third, we will compare long and short term effects of the workshop activity as a stand-alone intervention and as a supplement to existing information-delivery methods.Last, we will create and test a prototype web-based version within Penn State. At each step we will also obtain evaluation data to guide further refinement of the workshop activity. If we obtain expected results, we will proceed with dissemination of the product throughout the 24 Penn State campuses and through existing partnerships with other universities (e.g., through WISE institutes within the CIC) and commence further development of the web-based version for evaluation and dissemination.

Institutional Commitment

Vice Provost for Academic Affairs, Blannie Bowen, has commited his office to supporting the project in reaching its primary target audience: faculty peer decision makers, including search committee members, faculty involved in promotion and tenure, division and department heads, and others with responsibilities for faculty recruitment, advancement, and retention. For example, the Vice Provost oversees annual presentations to P&T committee members across all 24 Penn State campuses and this workshop activity could be folded into that program. Another venue in which this project could have broad impact is through the Vice Provost's Academic Leadership Forum for deans, department heads, and other campus leaders where a presentation on this project could recruit involvement of STEM units. Other Penn State locations will be reached through key contacts. For example, **Dhushy Sathianathan**, Professor of Engineering at UP, serves as the **Engineering Discipline Coordinator for Commonwealth Campuses**. He regularly convenes engineering faculty from the smaller campuses and has offered a meeting as a venue for the workshop activity; **Marian Walters, Associate Dean for Graduate Study and Research**, Penn State-Harrisburg, and recipient of an ADVANCE Leadership Award, has agreed to facilitate our project's access to and activities at Penn State-Harrisburg. **Dawn Blasko**, **Chair of the Penn State Faculty Senate** and Associate Professor

of Psychology, Penn State Erie-The Behrend College, has offered the support of the Senate and also has agreed to facilitate our project's access to and activities at Penn State Erie-The Behrend College.

Background

The PI and colleagues have used the workshop activity in graduate and undergraduate classroom contexts for about eight years. Initial development of the workshop activity originated in an invited presentation by the PI for a meeting of a network of nonacademic professional women in 1996. The presentation was framed as a contrast between a hypothetical "her" experience in opportunity and advancement at work with "his" experience. It was a powerful method of enabling audience members to connect individual life experiences to research literature.

The earliest version drew on demographic data and a broad body of research relevant to understanding the nature and operation of biasing factors in the workplace, including description of the minimization of personal disadvantage (e.g., Crosby, 1984), persuasiveness of aggregate, rather than piecemeal data to reveal patterns of discrimination (Crosby et al., 1993), contemporary forms of sexism (e.g., Swim et al., 1995), attributions of luck versus skill for women's success (Deaux & Emswiller, 1974), gender differences in beliefs about compensation for work (e.g., Major, 1989), effects of "token" or solo status Yoder & Aniakudo, 1997), and evaluation of women's versus men's emotion (e.g., Shields, 1987; 1991; Shields & Crowley, 1996).

Valian's (1998) landmark *Why So Slow?* and a growing body of research concerned with subtle sexism (e.g., Fletcher, 1999; Glick & Fiske, 1996) and stereotypes (e.g., Burgess & Borgida, 1999) contributed further refinements to the exercise and suggested the timeliness of developing it for broader dissemination. Research on women and work, gender in the academy, and gender and diversity issues in STEM fields has proliferated dramatically in recent years, which offers an even richer set of elements included in the workshop activity. To name but a few significant areas, Colbeck and Drago (2006) show that "caregiver bias" disadvantages women, but has little—or even opposite—effect on male faculty who have children. Spalter-Roth's (2005) and Williams' (2005) research also underscores that women often hit a "maternal wall" that has little to do with actual performance and more to do with stereotypes about mothers' suitability for serious science careers. Eagly's work has shown how women in leadership positions are evaluated in a negatively biasing way compared to men in those positions (e.g., Eagly, 2005; Eagly et al., 1995),

Information about patterns of bias is important because of the dramatic cumulative effects of even a small rate of gender bias (Martell et al., 1996). First, bias materially disadvantages women in terms of time sinks, lower pay, and lost opportunities (Valian, 1998). Second, there is a measurable psychological and emotional toll of dealing with "everyday" stress associated with outgroup status (e.g., Swim et al., 2001). Third, this pattern of exclusion and bias feeds back to institutional devaluation of women and women's performance with the result that women are less likely to be chosen for leadership positions (Hollenshead, 2003; Ferber, 2003) and/or less likely to be able to take them (Long, 2003).

Materials To Be Adapted

The format of the activity is an interactive demonstration of the exponential impact of gender inequity on women's advancement. The activity is designed meet three core learning objectives, namely for participants to (1) recognize the negative impact of the accumulation of apparently minor biases and unfair practices on women's ability to advance in their field, (2) develop awareness that different gender-relevant factors may be more significant at one stage in work

life than in others, and (3) recognize that patterns, not single incidents, are the most visible indicators of gender inequity in the workplace.

The exercise takes approximately one hour (including discussion and debriefing) and its experiential emphasis is typically only available in longer and more complex simulations. This proposal entails development, evaluation, and dissemination of a workshop activity which does not duplicate the form of other activities with similar goals. The proposed project builds on past ADVANCE program findings that have amply demonstrated the effectiveness of peer training. Like other programs sponsored by ADVANCE, the content of this workshop activity is guided by social science literature on unconscious bias, accumulation of disadvantage, and critical mass, as well as demographic data that illustrate career issues facing women and underrepresented minority scientists and engineers. The structure of this workshop activity is founded on demonstrated educational theory and techniques for effective learning (Bransford et al., 2000).

Briefly, four to eight individuals are randomly divided into two teams (Green and White). No connection to gender is made in forming teams; the gendered nature of Green versus White Team experience emerges over the course of the activity. The activity utilizes a board divided into three sections, each corresponding to a different phase in work life (entry level, mid-career, executive). All participants begin on square one of entry level, and the object of the activity is to advance through the three levels to be the first participant and first team to reach the top floor of the executive level. Green and White teams each have specific cards, and these are divided into three piles corresponding to levels. Sample items are listed in Table 3. Turns alternate between White and Green participants, with a White team participant taking the first turn. For each turn, one participant draws randomly from the team-specific cards for the level to which they have advanced (e.g., White participant in entry level gets a card from the entry level White pile; Green participant who has advanced to the mid-career level gets a card from the mid-career Green pile). Individual items for the two teams deal with identical issues, but in Green-specific and White-specific ways.

Items cover the gamut of issues that contribute to the pattern of subtle and ambiguous gender bias: work/family, salary, mentoring, climate, token status, and so on. Items at each level correspond to issues that are particularly salient at that point in one's career, such as leadership issues in Level 3. The factual basis of all items is documented in peer-reviewed, published empirical research and/or is visible in national labor statistics and trends. The degree of White team's actual advancement advantage can be manipulated to be 2, 5, or 7% by using designated subsets of items. The rules for the activity are simple and participants can proceed from introduction to engagement in the activity within a few minutes.

The board itself (steps on the ladder of advancement) represents events and experiences, positive and negative, that can happen to anyone regardless of whether they are on the Green Team or White Team, and some involve a move backward or forward (e.g., "You survive a company merger, move an extra step."). Similarly there is a "wild card" option that represents major unanticipated life events that are as likely for Green Team as White Team members (e.g., "At long last the Boss from Hell is fired! Lose a turn while you celebrate.")

Table 3. Sample Items

	White Team	Green Team
Level 1	Your boss congratulates you on your skill at completing a big project on time. He's sure that your skill will bring another project opportunity your way soon. Move forward 2.	Your boss congratulates you on your good luck at completing a big project on time. Move forward 1.
Level 1	You notice that a Playboy calendar and sexist jokes have started to appear on the	You talk to your supervisor about the Playboy calendar and sexist jokes that have started to

	lunchroom bulletin board. You wonder if this bothers your Green co-workers. Move forward 1.	appear on the lunchroom bulletin board. The calendar and jokes disappear, but you are pegged as a complainer. Stay where you are and weigh the costs and benefits.
Level 2	Your company tries out a "gender masked" evaluation system—you do well and get a good raise. Move forward 1.	Your company tries out a "gender masked" evaluation system—and your pay raise this year is better than ever! Move forward 1.
Level 3	Moving to your new office, you see that it is the same or bigger than offices of others who have the same job title. Move forward 1 while you feel good about how fair this is.	Moving to your new office, you see that it is smaller than offices of others who have the same job title. And all of them are White Team. Move forward 1 while you think about how to change the situation.

An instruction manual includes directions for the facilitator and suggested questions and topics for discussion (see Table 4). Questions explicitly address the intersection of ethnic minority status and gender in the workplace and work outcomes for multiply-disadvantaged individuals.

It has been important in the activity's development to ensure that the experience clearly and convincingly demonstrates the impact of cumulative gender bias while not evoking denial of the activity's validity or lasting negative emotional reaction. For example, the earliest versions included one "real life" card randomly among Green Team items in order to illustrate to participants that, even though the exercise focuses on "minor" biases, major gender-relevant events (e.g., overt acts of sexual harassment) still must be reckoned with. The effect, however, was too powerfully negative in this context and they were deleted. Although some negative mood effects on Green Team members is to be expected—in fact, it testifies to the impact of this brief simulation—Green Team/White Team items, wild cards, and other material are not written in a heavy-handed manner and, when feasible, humor is included.

One question that can arise in participant discussion is the extent to which White Team-specific liabilities exist. Two items therefore address areas (lack of sports interest/knowledge; questions about sexual orientation) in which a White Team member may experience disadvantage. For example, one White Team item (Level 1) reads: "On dress-down Friday you make a bold fashion statement in your leather pants. You spend the next week listening to 'gay jokes.' Move forward one as you wonder why people should give a second thought to what you wear." The corresponding Green Team item reads: "On dress-down Friday you make a bold fashion statement in your leather pants. You spend the next week listening to people comment about your body, wardrobe, weight, and motivation for dressing 'like that.' Move forward one as you wonder why people should give a second thought to what you wear."

Table 4. Sample Discussion Questions from Instructional Manual

1. The White Team has responsibility for interpreting rules and can change them if they see fit. Did the White Team interpret the rules differently than the Green Team at any point? If so, what were the consequences?
2. Choose one of the three levels of advancement. Compare the individual items for the Green Team and the White Team at that level. Do they seem fair? If so, what makes the item seem fair to you. If not, on what basis do you determine that the item is unfair?
3. As Kermit the Frog says, "It's not easy to be green." If, in this round of play, you were on the Green Team would you choose to be on the Green Team or White Team again? What about if you were on the White Team? What factors influence your decision?

4. You probably saw a difference in how events unfolded for the Green Team compared to the White Team. Can you think of other groups for whom a Green-type disadvantage might occur? In what ways would disadvantage be evident? What do you think would happen for people who are Green Team *and* a member of one of these other groups?

Current Assessment Data

An assessment tool was developed to measure students' perceptions of gender inequality issues before and after participation in the exercise (Zappe, 2006). It consists of a set of open-ended questions and a 28-item 5 point Likert-type scale (pre-participation and a post-participation versions), that measure change in perceptions as related to engaging in the workshop activity.

Formal data collected to date include surveys administered in several courses, including two sections of an upper-division course on the psychology of gender, one section of a lower-division honors course on the psychology of gender. Across all administrations, 31 individuals took only the pretest, 17 took only the posttest, and 47 completed both pretest and posttest. Evaluation studies were approved by Penn State's IRB and all data were collected in conformance with IRB requirements. Participation in the evaluation was voluntary and participants were not compensated. Participant gender (obtained on the posttest) was the only demographic data collected.

Based on the composition of undergraduate psychology courses at Penn State, the sample was predominantly Caucasian and comprised of psychology, biological science, human development, and various social science majors. The undergraduate psychology of gender class attracts students who already have some interest in gender issues, but a substantial proportion enrolls in order to fulfill university-mandated U.S. cultures requirement. Thus, data obtained from undergraduates should, if anything, represent an underestimate of the workshop activity's effectiveness.

***Quantitative evaluation data*.** Items for the assessment scale tap knowledge of facts regarding gender bias and concepts and processes relevant to equity issues (e.g., "Major, obvious incidents account for most forms of gender inequity in the workplace [reverse coded]; "Women are more likely to find mentorship in the workplace" [reverse coded]). Internal reliability was high for both the pre-participation survey, Cronbach's alpha = 0.85 (n = 77), and the post-participation survey, Cronbach's alpha = 0.87 (n = 62).

Although we could not randomly assign participants to pretest only, posttest only, and pretest plus posttest groups, comparison of the performance of these groups on the assessment scale can provide evidence of the workshop activity's effectiveness. Means and standard deviations for each of these groups are summarized in Table 5.

Table 5. Means and Standard Deviations for Pretest and Posttest Evaluation of Workshop Activity

	Pretest		Posttest	
Group	Mean	SD	Mean	SD
Pretest only, n = 30	106.6	8.7		
Pretest + posttest, n = 46	110.9	11.4	118.9	9.4
Posttest only, n = 17			113.3	11.1

We first completed a paired-sample t-test for participants who had completed both the pretest and posttest and obtained a significant difference in the predicted direction, $t(43) = 6.78$, $p < .001$. As expected, comparison of pretest scores for the pretest only and pretest plus posttest

group was not significant, t(74) = 1.79, p = .08. Similarly, comparison of posttest scores for the posttest only and pretest plus posttest group was nonsignificant, t(60) = 1.84, p = .07. Thus, though there appears to be some self-selection among those participants who were able to complete both pretest and posttest, overall they are not reliably different from those who completed only one component of the evaluation. We therefore compared pretest and posttest scores for these groups. This comparison would reveal whether completion of the pretest by itself accounts for posttest effects. A significant pretest versus posttest difference in the predicted direction was obtained, t(45) = 2.50, p = .016. There are a number of relatively random reasons that participants may have completed only one portion of the evaluation (e.g., absence on the day that the pretest was distributed or the day the exercise and posttest were completed; losing the pretest or posttest form). It could also be, however, that students who found the exercise more useful or engaging were more likely to complete the posttest, or that students who learned more were more motivated to demonstrate their learning by completing the posttest. Thus, one component of our proposed project entails evaluation of the STEM-adapted version employing random assignment to assessment conditions.

Last, we examined whether gender or Green Team-White Team differences occurred. For gender, there was no difference on either the pretest (pretest plus posttest group), t(44) = .46, p = .65, nor a difference on the posttest (posttest only combined with pretest plus posttest group), t(60) = 1.2, p = .23. These results must be interpreted cautiously and as tentative, however, as the number of men, particularly in the pretest plus posttest group was small and the tests lacked sufficient power for the analysis. Team analysis showed no significant difference between White Team and Green Team participants on either the pretest (pretest plus posttest group), t(44) = 1.61, p = .11, or a difference on the posttest (posttest only combined with pretest plus posttest group), t(60) = 1.2, p = .90. In fact, means were essentially identical on the posttest for White Team (M = 117.51, SD = 9.8) and Green Team (M = 117.17, SD = 12.19) participants.

***Qualitative evaluation data*.** Content analysis was performed on pretest and posttest open-ended responses. The pretest indicated that participants understood gender equity in terms of differential treatment and pay for women and men in the workplace. Participants were asked to identify what factors or instances contributed to gender inequity in the workplace. The most frequent factor listed was that stereotypes existed which influenced the differential treatment of women in the workplace, and stereotypes and sexist beliefs were most cited as causal factors. When asked whether they had experienced any sort of gender inequity in the workplace, many students stated that they had. The types of examples that they most often listed included the gender-related division of tasks in the workplace or the hiring practices based on gender.

Posttest results indicated that participants would not greatly change their initial definition of gender inequity, but now also reflected the idea that the gender inequities often consist of unseen or subtle differences. As one participant noted, “It’s amazing how men and women can both accomplish the same thing yet be viewed differently.” When students were asked to identify what they learned from the activity, again, the most frequent response was that gender inequity consisted of smaller, subtle inequities rather than large events (32.8%).

Finally, students were asked to state how the workshop activity made them feel. Reports varied based on whether the students were on the Green or White Team. Many students on the White Team tended to state that being on the winning team made them feel good, though many followed up with a more negative sentiment. Several felt worried about their personal future. Participants who had been Green Team members had much more negative feelings, including depression, frustration, and anger. Swim et al. (2001) have shown that experiencing discrimination on a given day is associated with increases in anxiety and anger on that day but is not associated with state self-esteem, suggesting that discrimination’s immediate effects on emotions do not negatively impact feelings about oneself.

In summary, these results show that the workshop activity yields measurable increase in understanding of subtle bias, that the exercise is engaging and interesting, and that it yields an appreciation of facts that participants may have already been exposed to, but not fully grasped.

Proposed Activities

The proposed project entails adaptation of the workshop activity to STEM fields in an academic context, its evaluation in that context, systematic follow-up as to the longer-term effects of exposure to this information, and dissemination of the project results. If Year 1 and 2 evaluation demonstrates the activity's effectiveness as noted above, the workshop activity will be disseminated throughout Penn State, and a Web-based multi-participant prototype will be developed. Evaluation specialists at Penn State's Schreyer Institute for Teaching Excellence (http://www.schreyerinstitute.psu.edu/) will serve as consultants on design and analysis of assessment tools. The overall timeline is illustrated in Table 6.

Year 1 adaptation of the workshop activity for academic STEM contexts will include the addition of new elements to the activity. Special attention will be given to incorporating additional methods for illustrating the fact that gender disadvantage is exacerbated by other aspects of social identity in combination with gender (e.g., race; sexual orientation) and that these effects are not merely additive. New and revised items for the workshop activity will be based on ADVANCE materials (both published and Web-based), peer-reviewed social science research, and statistical data on women and minority group representation in STEM disciplines gathered for ADVANCE IT projects. A key feature of the workshop activity's positive impact on participants is that it is grounded in solid empirical research.

Adaptation of the workshop activity to STEM will employ the same iterative process as used in development of the workshop activity thus far. Individual items are generated from published research and suggestions made by participants in post-activity discussion. New provisional items are documented and added to the activity; if items are flagged in discussion (e.g., "too unfair"), they are modified or dropped. Thus, the pool of items will continue to be under continuous review and expansion. In addition, all faculty and administrator groups recruited for this project will complete brief post-participation evaluation forms to measure their satisfaction with the experience, whether they would recommend it to others, and their suggestions for improving the experience. These responses will be used to inform further refinements of the activity and its elements.

Prior to its implementation, the STEM-adapted workshop activity will be tested to determine its effectiveness at conveying information about the nature and persistence of unconscious bias. The purpose of the study is to test whether that the STEM version, like the orignal workshop activity, is effective in teaching about the nature and operation of schemas that underlie development of patterns of inequity. Rigorous testing of the adapted activity's capacity to enhance understanding of the nature and operation of bias-generating schemas in the STEM context requires an experimental design that permits random assignment to conditions and a sample size adequate to valid statistical testing. The number of available participant faculty and administrators is not large enough to undertake a truly randomized study. Nor would it be the best use of this pool. Therefore, undergraduate research participants will be recruited via the Psychology Department pool for this study. Impact of the activity will be measured using a design comparing posttest evaluations for three different groups: pretest + workshop activity + posttest; pretest + posttest; activity + posttest. We hypothesize that posttest scores for the pretest + posttest group will be significantly lower than either of the other two groups.

In **Year 1 and 2** adaptation and implementation, the workshop activity will be employed in diverse campus contexts in order to ensure its suitability for dissemination to a wide variety of institutional types. The project includes different sites within Penn State and personnel at

different positions of administrative authority, and in different venues and in institutional situations of different size. For example, the **Behrend campus**, which is a key site for implementation, functions as a liberal arts college. However, over half of Behrend's students are in engineering and business, and over 60% of students are male. All administrators are men. And many women faculty are the only ones in their program. Of 220 faculty at Behrend, only 3 women are full professors. In contrast, the smaller general **Commonwealth Campuses** (e.g., Penn State Mont Alto; Penn State McKeesport) average 1200 students and 50 full-time faculty.

If adaptation and implementation proceed successfully, in **Year 3** we will use Adobe *Connect* to pilot test online interactive participation in the workshop activity. *Connect* is a secure, flexible web communication system for web conferencing and online collaboration that is widely used by Penn State administrators. We will use a simple interactive version of the workshop activity which will enable us to determine whether participants connected virtually benefit from participating in the workshop activity to the same extent as in-person participants. Computerizing any experience can run the risk of losing the essence of the experience itself, which may hurt its pedagogical value. *Connect* employs audio and visual communication through camera and microphone which potentially could overcome the isolation of physically separated participants. If this initial computer-based version shows promise as reflected in (a) equivalent or better learning and (b) report of positive experience with the method, we will seek funding to develop and assess it fully. Initial exploration of a web communication version of the workshop activity is most feasible within a context where geographically dispersed faculty and administrators share a single university identity, as they do at Penn State. Furthermore, this prototype computerized version will also enable us to explore illustration of factors such as the cumulative impact of bias on salary or the "maternal wall" disadvantage.

Project Assessment

The short term and long term effects on both retention of information and self-reported impact on relevant behavior will be assessed using surveys delivered prior to and after the workshop activity and focus groups. Follow up surveys and focus groups will be conducted with different participants as two long-term interventions to check for information retention and impact on behavior. These will be conducted 9-12 months after participation in the activity. In addition, the effects of exposure to the workshop activity will be compared with the effects of other successful methods of delivering information about subtle bias. We anticipate that other methods of measuring the efficacy and impact of the proposed project above and beyond those described here will emerge as each form of the workshop activity is more widely implemented and disseminated. All evaluation instruments will be developed and analyzed in consultation with the Schreyer Institute for Teaching Excellence.

Does this experientially-oriented workshop activity enhance the effectiveness of currently available self-guided Web-based informational activities? How effective is this intervention as a stand-alone compared to currently available self-guided Web-based informational activities? Research participants for these studies will be recruited through the Psychology Department pool in order to allow random assignment to evaluation condition and sufficiently large sample size. Three groups will be compared. The tutorial only group will complete an informational tutorial activity available through the Web (e.g.,Tutorials for Change available through the Hunter College ADVANCE site), the tutorial plus workshop group will complete the tutorial plus participate in the workshop activity (STEM version), and the workshop only group will complete the workshop activity (STEM version). Qualitative and quantitative assessment tools will be used for all three groups to measure post-participation (a) comprehension of the schemas and unconscious bias and (b) identification of strategies to deal with subtle biases. We predict that the tutorial plus workshop will be significantly more effective than the tutuorial alone, and that workshop only will be more effective than the tutorial alone.

Does the workshop activity effectively increase participants' interest in engaging in behavior that overcomes subtle bias? Post-participation focus groups will be formed from faculty and administrator groups recruited for this project. Focus group questions will assess participants' perceptions of their own administrative practices. Qualitative data will be examined to determine whether their account of activity generates insight into daily events and practices that inadvertently promote the maintenance of gender bias in participants' departments and colleges. These data will be useful in planning further interventions and transformational projects for Penn State.

Is information obtained through participation in the workshop activity retained? Is retention of this information correlated with behaviors aimed at applying that knowledge to reduce the effects of unconscious bias on their own decision-making? Faculty and administrator participants will be asked to indicate their willingness to be contacted for participation in a long-term follow-up. Follow-up evaluation will occur 9 to 12 months after participation in the workshop activity. Two types of assessment will be made: (1) recall of factual information included in the activity and (2) self-report of specific activities that are linked to overcoming the influence of unconscious bias in their own decision-making, for example, efforts made to increase diversity of a hiring pool or pointing out instances of bias to colleagues.

Further Dissemination

The workshop activity can be economically and easily disseminated within Penn State and to other universities and institutions. Extensive support materials and documentation will ensure that first-time users have no difficulty with the mechanics and, more importantly, that the intended outcomes are achieved. Project results will be presented at the annual meetings of groups concerned with issues of women's advancement in STEM fields, such as Women in Engineering Program Advocates Network (WEPAN), other relevant consortia, such as the annual meeting of WISE Programs in the Committee on Institutional Cooperation, and scholarly professional meetings (e.g., American Psychological Association). We also aim to publish the results of this project in one or more peer-reviewed journals.

Performance plan

The scope of the project dictates a compact management plan. The PI will manage all aspects of the project and coordination between the PI's lab and collaborating units and individuals: Schreyer Institute for Teaching Excellence, the Vice Provost's office, faculty leaders presently committed to the project and those added as the project progresses. The graduate assistant under the direction of the PI will provide another line of information and responsibility. This half-time graduate assistant will serve as primary liaison with the Schreyer Institute evaluation specialists, coordinate adaptation of the workshop activity for academic STEM, coordinate recruitment of assessment study participants, assist the PI in dissemination within and outside the university.

An initial organizational meeting will bring team members from all collaborating units together for discussion of the project's overall goals for each year, collaborating units' domains of responsibility and inter-unit communication, year-by-year key goals for each unit, scope of responsibilities for key members of each collaborating unit, and key completion dates.

Dissemination in **Years 2 and 3** will include appropriate distribution of the activity to internal and external partners. Coordination of unit goals and timetable to achieve them will be coordinated on the project calendar at an early meeting of the full project team. We anticipate that the evaluation of the outcomes of the proposed project will extend beyond the three year period described here and involve types of assessment above and beyond those described here. **Year**

3 therefore includes creation of a structure for tracking referrals and inquiries and collecting data in connection with our longer-term follow-up questions.

Table 6. Timeline for Proposed Activities

	Adaptation	Implementation/ Evaluation	Dissemination
Year 1	1. Adapt items and format to STEM fields 2. Edit instructional manual for STEM academic settings 3. Test STEM-relevant format 4. Set up plans and process for assessment data collection	1. Pilot STEM-relevant format at one UP college and one campus; evaluate and revise	
Year 2	1. Enhancements to instructional manual; continued development of new items 2. Set up and pilot test Adobe *Connect* interactive version	1. Offer workshop activity in all specified settings 2. Conduct follow-up surveys/focus groups with pilot participants	1. Present preliminary findings at national conference 2. Workshop activity ready for dissemination throughout Penn State
Year 3	1. Continue development of new items 2. Set up structure for tracking referrals and inquiries at project's conclusion	1. Offer workshop activity in all specified settings 2. Conduct follow-up surveys/focus groups with Year 2 participants 3. Complete analyses 4. Set up post-project data collection & inquiries management plan	1. Submit article(s) to peer-reviewed journal 2. Workshop activity ready for dissemination to CIC and ADVANCE sites

Concluding Remarks and Remaining Issues

The **intellectual merit** of the proposed adaptation, implementation, and dissemination of the workshop activity lies in its effectiveness as an innovative experiential method for teaching and learning about subtle gender bias in the STEM academic context. Workshop activity materials are based on solid empirical research and demographic data. The project builds on existing IT products and adapts an effective workshop activity in creating an innovative intervention product that can be used in a variety of academic STEM contexts, especially those with limited resources.

The project will have **broader impact** through its contribution to science education and potential benefit to society. The PI's lab serves as a teaching environment for both undergraduate and graduate students. Undergraduate and graduate research assistants will be involved in all phases of the proposed research, through directly assisting in preparation of materials, evaluation research, and preparation of materials for project dissemination. Through these activities and meetings of the project group, the proposed work fosters training and learning as it advances discovery. In addition, recruitment of participants for evaluation studies will be done insofar as possible to ensure a representative sample of from all ethnic and racial subgroups within the populations studied. Finally, results will be disseminated to the public through a project website, and granting interviews to the popular press. The project will benefit society by educating academic decision makers about the operation of subtle biases. The project will also benefit society through its potential to be adapted for use in other settings, such as human resources and other venues in which people need or want to learn about how substantial inequities can develop over time.