Mid-Project Research Report II

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<center>SUMMARY</center>

The objective of the Ohio State ADVANCE Comprehensive Equity at Ohio State (CEOS) Project is to transform STEM cultures in three participating colleges at Ohio State to increase the numbers of women faculty and faculty of color in these fields. Project participants expect to develop an inclusive and supportive culture that will contribute to the retention and advancement of diverse women faculty in science and engineering disciplines.

This report summarizes all of the relevant data collected and analyzed between January 2009 and November 2011 by the CEOS Project Research Team. It begins with a brief introduction to the Transformational Leadership model which provides the conceptual framework for the project. A logic model that translates this conceptual framework into the project activities is summarized Appendix A. A discussion of the project activities follows, beginning with a summary of relevant findings from a twice administered (2008 and 2011) OSU faculty survey that allows the researchers to gauge changes in levels of STEM faculty satisfaction with their departmental and college cultures. The rest of the report focuses on research findings to date for the three programs undertaken under CEOS auspices: leadership development for deans and chairs, peer mentoring circles for STEM women faculty, and entrepreneurship training for women in STEM. There were only limited data provided for the action learning teams, which made progress in 2011.

Major findings:
- The faculty survey continues to underscore the perception that women in the STEM fields in the three participating colleges at OSU feel overburdened and undervalued in their units, particularly at the associate level. While some items of interest have improved since the initial survey in 2008, others have worsened.
- Analysis of deans' and chairs' workshop feedback indicates that deans and chairs who took part in the ongoing workshops consider them to be highly beneficial and that for some the workshops seemed to change how these leaders thought about diversity and excellence in relation to their college and department cultures. A significant number of these leaders reported engaging in best practices aimed at recruiting and retaining more women and faculty of color. The workshops have kept the idea of a more diverse faculty at the forefront of leaders' concerns and interests.
- A leadership inventory administered to the deans and chairs in 2008 and again in 2011 demonstrates that small amounts of change in behavior and perception have occurred among our leaders. This is true not only of those who have participated actively, but also of those who have only recently been hired or remain disengaged. This may demonstrate that the ADVANCE mission is beginning to permeate the cultures of OSU STEM departments.
- Previous analysis of the concerns surrounding the peer mentoring circles led to a reformatting in 2011. Participants who remained in the circles appreciated networking/connecting with women in other departments and colleges; meeting other women in similar career and life stages; receiving valuable advice; and seeing that others have similar problems and questions. A comparison of findings from 2010 and 2011 indicates that participation in mentoring circles had a positive effect on retention of women STEM faculty.
- Follow-up with the first cohort of REACH participants demonstrates that workshop participants began with interest in commercialization of their research, but lacked knowledge of many aspects of the process and access to potential partners in business and industry. The training and examples provided by the workshops appear to have provided a number of the participants the opportunity to begin making real progress toward commercialization. Nonetheless, there are marked areas where continued support is needed.
- The Action Learning Teams have had a slow start, spending much of their first year in the early stages of vision formation. However, it is notable that some action plans are in place and set to begin implementation.

INTRODUCTION

This report summarizes research from the Ohio State ADVANCE Comprehensive Equity at Ohio State (CEOS) Project. The results are based on research conducted between January 2009 and November 2011 (with emphasis on 2011) in initially[1] four STEM colleges (Biological Sciences, Mathematical and Physical Sciences, Engineering, and Veterinary Medicine). We begin with a brief introduction to the transformational leadership model that serves as the conceptual framework for this project. The logic model that translates this conceptual framework into the project activities is summarized in Appendix A.

The discussion of the project activities begins with a summary of relevant findings from two implementations of an OSU faculty survey that has allowed us to gauge changes in levels of STEM faculty members' satisfaction with their departmental and college cultures. The remaining sections of the report focus on research findings to date for the three programs undertaken under CEOS auspices: leadership development for deans and chairs, peer mentoring circles for STEM women faculty, and entrepreneurship training for women in STEM. Data from the action learning teams are limited as these teams made little progress in 2011.

TRANSFORMATIONAL LEADERSHIP MODEL
The CEOS Project aims to transform STEM departmental and college cultures at Ohio State to increase the numbers of women faculty and faculty of color in these fields. We expect an inclusive and supportive culture to develop that will contribute to the retention and advancement of diverse women faculty in science and engineering disciplines.

The Transformational Leadership model guiding our work (Figure 1) connects five important dimensions of institutional transformation. In the context of CEOS objectives, our vision for the university is one that fosters inclusivity and supports faculty achievement and progress. To achieve that vision, it will be necessary for the leadership, deans and department chairs, to evaluate prevailing cultural assumptions and shift them as necessary. The attitudinal changes regarding diversity, inclusivity, and their link to excellence will lead to changes in current practices. These new practices will need to be supported by changes in university policies such that both institutional and individual needs are understood and met.

A key to achieving this vision is an informed and committed leadership that works collaboratively within and across departments and colleges, addressing deep-seated cultural assumptions, creating local change, and collaborating on strategies to achieve comprehensive equity across the entire institution.

Our model includes characteristics of leadership teams themselves, as well as processes those teams undergo and changes they produce in institutional culture. As leaders work together, they will develop a common vision by inclusive thinking. That inclusivity can only be achieved if teams are challenged to question and shift shared assumptions and to change practices that discourage full participation. The development of an inclusive vision, and changes in underlying cultural assumptions and in daily practices must occur interdependently for successful transformation of departmental and college culture. We have begun work on this transformation by attempting to address all five areas as interconnected dimensions within a holistic leadership plan.

CEOS has sponsored four programs targeting different audiences in the participating colleges: (a) leadership training for *deans and department chairs*; (b) action learning teams consisting of *deans, chairs,*

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[1] There has been an organizational change in the University since the start of this project and the initial four colleges are now housed in the Natural and Mathematical Sciences (NMS) Division, College of Arts and Sciences, the College of Engineering, and the College of Veterinary Medicine.

faculty and staff; (c) peer mentoring circles for women *faculty*; and (d) entrepreneurship training for *faculty* women. Each activity attempts to include aspects of structured work, peer networking, and reflective practice.

Figure 1: Transformational Leadership Model

The work with the deans and chairs touches upon all five components of the model depicted in Figure 1. The deans' and chairs' workshops build upon a vision of support and inclusiveness through clarifying existing cultural assumptions and their implications for a diverse faculty and contemplations of the changes and shifts in attitudes necessary to create an inclusive and welcoming environment that focuses on excellence. It is expected that this change in attitudes will come about through a better understanding of individual and collective needs and will lead to changes in current practices and better implementation of flexible career policies at the departmental and college levels that will eventually become institutionalized at the University level.

It is expected that the peer mentoring circles with their focus on individual women faculty and "individual needs [being] understood and met" will lead to both greater support for women faculty and the emergence of recommendations for policies and practices that are conducive to an hospitable environment for a diverse faculty.

Similarly, Project Reach's focus on entrepreneurship will lead to greater participation among women faculty in successful transformation of research products into commercial products and the institutionalization of support for such activity within the University through collaboration among the STEM and business colleges and University administration.

The action learning teams will focus on the implementation of the Transformational Leadership model by addressing specific issues and problems related to local department and college cultures, practices, and policies. It is expected that their outcomes will lead to proposed changes that can be replicated in other departments and colleges.

We are working with innovative techniques to facilitate group cohesion, expression, and engagement in all forums, workshops, and materials. World cafes, peer mentoring circles, and action learning teams are all facilitated by experienced coaches and facilitators, often drawing upon the knowledge and skills of the University's human resources department.

The four activities sponsored by CEOS are listed in the Activities column of the logic model (Appendix A). The remaining columns list the outputs of these activities and the corresponding expected outcomes.

FACULTY SURVEY

One of the sources of data regarding departmental and university culture is the Faculty Survey, which consists of 75 questions regarding various aspects of University life. We are using the 2008 data as the base and comparing that with results from a second implementation of the survey in 2011.

The 2008 data include responses from 1357 faculty members of whom 289 were in the four CEOS Colleges as designated in 2008. The corresponding numbers for 2011 are 1383 and 324 (we have not included Instructors and respondents who did not provide information regarding their gender). The breakdown of the respondents by rank and gender is given in the table below.

	CEOS Colleges				Full OSU Sample			
	2008		2011		2008		2011	
	Male	Female	Male	Female	Male	Female	Male	Female
Full Professor	138	16	151	26	406	113	428	133
Associate	51	22	61	25	279	180	271	204
Assistant	36	26	40	21	179	200	164	183
Total	225	64	252	72	864	493	863	520

These numbers are to be compared with the following breakdown of potential respondents from the two cohorts. The response rate among the tenure track faculty taken as a whole is approximately 47 percent in both implementations of the Faculty Survey.

Number of University Faculty	2008			2011		
		Potential Respondents			Potential Respondents	
		Male	Female		Male	Female
Full Professor	1174	953	221	1227	968	259
Associate	952	634	318	964	610	354
Assistant	742	414	328	752	414	338
Total	2868	2001	867	2943	1992	951

For this analysis we focus, as we did in our earlier report, on summary counts of responses to questions related to
- Relationships
- Workload and Stress, and
- Retention.

As a broad generalization based on data from the CEOS colleges, much of the dissatisfaction expressed in these surveys was among associate professors, both men and women. There were some notable differences between the sexes in their responses at all three levels—assistant, associate, and full professor.

Professional Relationships

The tables below provide the percentages of respondents in the CEOS and non-CEOS colleges, as well as the university as a whole. The total number of individuals from which these percentages are obtained is also provided. When there is little or no change between the 2008 and 2011 percentages or between the genders, data are provided only for the CEOS colleges. In general, the full table is provided when there is more than a five-percentage point difference in the percentages.

Dissatisfaction with *social relationships with colleagues*.

Social Relationships	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	15.7	18.8	13.8	13.8	28.8	30
Male	17.4	13.9	15.9	12.9	22	16.4
N	1,276	1,368	1,008	1,046	268	322

The percentage of men who are dissatisfied decreased in the CEOS colleges as well as the University as a whole. However, over the same time period, the percentage of women who are dissatisfied with their relationships with colleagues remained approximately the same in the CEOS colleges and across the University.

The gap between men and women increased slightly for *Dissatisfaction with professional relationships with peers,* with 21.8/26.4 percent of women expressing dissatisfaction compared to 14.1/17.2 percent of men. Note that the 2008 percentage is the first number followed by the 2011 percentage, hence the format we are using for presenting the numbers is 2008/2011.

Although generally more satisfied than women with their relationships, male faculty were more likely to express dissatisfaction with the *competency of their colleagues* in 2008, but that changed in 2011. Of the men, 11.9/11.2 percent were dissatisfied with the competency of their colleagues, compared to 7.8/13.9 percent of women. The satisfaction level among the men remained approximately the same, while that among the women seems to have gone up slightly.

Another question asked whether faculty felt *uncomfortable expressing their opinion* at faculty meetings. In 2008, more CEOS male faculty members (28.3 percent) were uncomfortable than their female colleagues (22.8 percent); by 2011 discomfort rose for women to 27.8 percent and remained approximately the same, at 29.3 percent, for men. Thus the gender gap has closed, without an improvement in the climate. By contrast, responses from non-CEOS colleges showed a larger gender gap

for this question in both years. Concern about expressing opinions appeared to be less of an issue in CEOS colleges than in other units.

Other questions on the survey similarly asked about feelings of inclusion/exclusion. For a question on feeling *ignored in their departments,* 26.8 percent of both men and women faculty in CEOS colleges reported dissatisfaction in 2008. By 2011 those percentages increased to 34 percent of men and 31.4 percent of women.

The largest gender gaps in faculty satisfaction with relationships tend to be reflected in questions regarding *informal networks*. In 2008, 32.1 percent of the female faculty members were dissatisfied with the *opportunities for collaboration* in their departments as compared to 19.1 percent of men. Those numbers were comparable in 2011 (29.5% women and 20.4% men) showing a persistent gap in perceived collaboration opportunities.

Similarly, in both rounds of the survey, more women than men reported feeling excluded from the *informal networks* of their departments all across the University.

Excluded from Informal networks	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	28.4	31.0	28.0	30.3	33.4	34.8
Male	21.6	22.5	22.0	22.6	20.4	22.2
N	1,130	1,364	885	1,044	243	320

Finally, we examined relationships among faculty through the lens of access to mentoring. There was widespread dissatisfaction across the university with access to mentoring opportunities. About half of all faculty who responded to the survey expressed dissatisfaction, and we found gender gaps across the university that were exacerbated in CEOS colleges relative to other units.

Inadequate mentoring	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	50.4	50.0	49.4	50.0	56.9	52.8
Male	43.0	40.0	43.3	39.8	42.0	37.9
N	976	1,357	775	1,042	201	315

The overall picture with respect to relationships and mentoring has not changed much between 2008 and 2011. Men and women at OSU report slightly different levels of satisfaction with their peer relationships in 2011. Women tend to be less satisfied than men. However, in general the differences are small. The area of greatest difference between the sexes with regards to relationships is networking. This finding reinforces the idea that it is important not only to address formal policies but to also ensure that women in academia receive informal support through mentoring and collaboration efforts.

<u>Stress and Workload: Focus on Associate Professors</u>

High percentages of female associate professors reported that their workload is either too heavy or much too heavy. However, the percentage of women reporting heavy workload has dropped in 2011 compared to 2008, though still remaining considerably higher for women in the CEOS colleges.

Heavy Workload *Associate Professors only*	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	68.0	63.6	66.0	61.6	82.0	76.0
Male	47.4	50.1	46.2	48.5	53.0	55.7
N	448	469	377	383	67	86

Another source of stress for faculty derives from feelings of being under-appreciated. The table below shows that in 2008, 61 percent of women Associate Professors in the CEOS colleges agreed with the statement "*I have to work harder than some of my colleagues do to be perceived as a legitimate scholar.*" By 2011, 72 percent of women in CEOS colleges felt that way. Men faculty in the CEOS colleges likewise showed greater dissatisfaction in 2011 (36 percent) than in 2008 (28.6percent). By contrast, faculty in other units showed no appreciable change in their perceptions. Furthermore, a large gender gap for CEOS colleges (Fig. 5a) was not reflected in other units.

Work harder for legitimacy *Associate Professors only*	Whole University		Non -CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	46.4	50.3	44.5	47.2	61.1	72.0
Male	37.1	37.4	38.9	37.6	28.6	36.0
N	385	470	325	385	60	85

<u>Resources</u>

The largest difference between the responses in 2008 and 2011 is in the levels of dissatisfaction among the men with respect to start-up funds both in the CEOS colleges and across the University. In 2008, approximately a third of the men in the CEOS colleges were dissatisfied with their start-up funds. These percentages dropped to half that number in 2011 both in the CEOS colleges and across the University. Although across the University the levels of dissatisfaction with start-up funds were similar among the men and women, in the CEOS colleges the women seemed much less dissatisfied. There is not much difference in the percentages between 2008 and 2011 in the dissatisfaction levels for the women. In 2008, women compared to men, started off with lower levels of dissatisfaction. However, their dissatisfaction percentage did not drop as much as it did for the men and thus by 2011, 22 percent of the women were

dissatisfied compared to 17 percent of the men. In 2011 women were less satisfied than men with startups in CEOS Colleges and across the university.

Dissatisfaction with start-up funds	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	32.5	19.1	33.9	18.5	24.5	22.2
Male	32.1	16.8	31.3	16.7	34.2	17.0
N	943	1,362	735	1,042	208	320

With respect to levels of dissatisfaction with office space there is not much difference between men and women and between 2008 and 2011. The percent of women dissatisfied with office space in 2008 was 17.2 compared to 16.2 of men. By 2011 the levels of dissatisfaction were 18.3 percent and 18.1 percent for women and men respectively.

The percentages of faculty dissatisfied with laboratory space have changed considerably in the rest of the University compared to those in the CEOS colleges. The percentages of faculty dissatisfied with laboratory space in other than the CEOS colleges were 35.4 and 25.7 percent for women and men faculty respectively in 2008. In the CEOS colleges these percentages were 28.3 for women and 24.8 for men. However, in 2011, these percentages had dropped substantially for both women and men in the other colleges, but did not show a similar drop in the CEOS colleges.

Dissatisfaction with laboratory space	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	33.3	16.8	35.4	15.7	28.3	24.0
Male	25.4	16.3	25.7	13.8	24.8	22.1
N	839	1,363	616	1,043	223	320

<u>Retention</u>

The percentage of female faculty members who said "no" when asked, "If you were to begin your career again, would you *still want to come to this institution?"* increased significantly from 2008 to 2011 in the CEOS colleges.

Not come to OSU	Whole University		Non-CEOS		CEOS Colleges	
	2008	2011	2008	2011	2008	2011
	Percent	Percent	Percent	Percent	Percent	Percent
Female	16.0	15.0	16.0	14.0	11.7	20.0
Male	19.0	14.8	19.0	13.1	18.3	18.0
N	1,130	1,366	884	1,044	207	322

The percentage of female and male faculty agreeing that they probably would not *want to be a professor* remains small (below 5%).

LEADERSHIP DEVELOPMENT

The deans and department chairs of our participating colleges formed a cohort that met quarterly since January 2009 to learn about and reflect on leadership issues. Participants took a Leadership Inventory in 2009 and again in 2011. They engaged in workshops that focused on a variety of topics related to transforming STEM department cultures. Throughout, these workshops stressed 1) recognizing and addressing underlying cultural assumptions that pose barriers for women in STEM departments and colleges; 2) inclusive versus exclusive practices to help leaders understand the impact of different behaviors, emphasizing gender, ethnicity, and ability status; and 3) the importance of faculty mentoring throughout a long career, to prevent post-tenure burnout, recognize and redirect frustration, and engineer equitable workloads and reward structures. Transformative leadership skills and practices formed the core of this phase of the project, providing a necessary background for deans and department chairs to become ready for the Action Learning Teams which were formed in 2011.

<u>Leadership Inventory</u>

The initial responses to the Leadership Inventory indicated that many participants already thought about leadership and diversity issues positively. In all instances where a response of five was desired, the mean was above four (For all questions 1=not at all, 2=rarely, 3=sometime, 4=frequently, 5=almost always). In all instances where a response of one was most desired the mean was below 3.
These baseline results of our leadership inventory indicated little room for improvement. As predicted, there has been little change of particular significance in the responses given in the second administration of the inventory. The average change in mean for those questions on which a 5 was desirable was only 0.11 and there was no average change in mean for questions desiring a low response. The largest shift in the mean was 0.42 and the largest shift in standard deviation was 0.23.

Of the 38 questions included in the inventory, 16 saw an improvement in the mean by at least 0.1. Of these 16 items, 5 also indicated a reduction in standard deviation (though the change in standard deviation is minimal). Of the 22 items without a significant change (0.1 or more) in mean, 7 items did, however, have a decrease in standard deviation.

Only two of the 38 items had a reduction of the mean by 0.1 or more. However, these questions ("I do what I can to end gender discrimination" and "I miss opportunities for my department/college") may elicit more negative responses as individuals gain more awareness of the issues. For instance, it is easier to answer that you do what you can to end discrimination when you do not believe much discrimination occurs or that there is not much that can be done. Participation in our workshops highlights the presence of and potential actions to address subtle biases in our STEM colleges. Therefore, it is not surprising that participants have become more aware and perhaps pessimistic about what they have accomplished on these fronts to date. It should be noted that when only those who have participated in at least one CEOS workshop are included in the analysis of these questions, the means are **worse** than those of their newly appointed colleagues who have not participated (4.5 vs. 4.8 and 2.5 vs. 2.2 respectively).

Only seven items had changes in the mean of more than 0.25. These items are shown in the table below. Of particular note, agreement with the statement "I think equity is essential to academic excellence" increased by .33. While this change is a positive indication of the effects of CEOS programming, it should be noted that similar items ("I think ethnic and gender diversity are essential to a robust faculty" and "I think equity is second in importance to academic excellence") did not indicate any change.
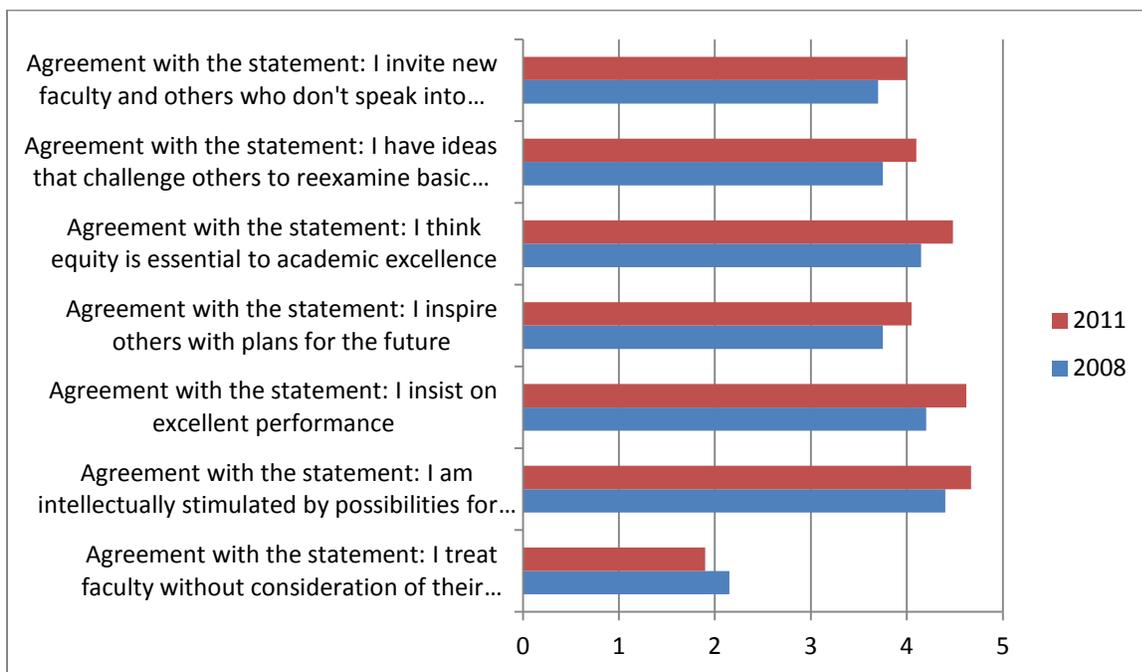
Workshops for Deans and Chairs

Workshops were conducted quarterly beginning in Winter 2009 and continuing through Autumn 2011. They ranged from a general orientation to Project CEOS, to gender equity issues in STEM, to leading change, to exploring the relationship between diversity and excellence, and assessing whether Project CEOS has made a difference. The following table summarizes the feedback from attendees who completed evaluation forms distributed at the workshops.

<div align="center">Dean's and Chairs' Feedback from Workshops</div>

Workshop	Satisfied/Very Satisfied	Important/Very Important	Total # Respondents
Intro to CEOS (Wi 2009)	94%	82%	22
Gender & STEM Equity (Sp 2009)	100%	100%	15
Leading Change (Su 2009)	95%	95%	20
Impact of Family on Women in STEM (Au 2009)	100%	100%	9
Diversity & Excellence (Wi 2010)	85%	92%	32
Leveraging Diversity (Sp 2010)	100%	99%	19
Has CEOS Made A Difference (Au 2010)	100%	100%	7
Survival Skills for Administrators (WI 2011)	100%	--	40
Sustaining Diversity and Excellence (Sp 2011)	--	100%	10
Recruiting Diverse Faculty (Au 2011)	76%	76%	33

As these data indicate, a large majority of respondents were either positive or very positive about each of the workshops, indicating (on a scale from very satisfied to satisfied to neutral to not satisfied and very unsatisfied) that they were satisfied or very satisfied and that they found the workshop content important or very important.

In the qualitative portion of the feedback for each workshop participants were asked "What did you gain by participating in this session?" In the more interactive workshops, many respondents reported they enjoyed meeting leaders from other colleges, hearing new viewpoints and networking opportunities. Many respondents appreciated the value of receiving "facts" and "data" that back up the qualitative information on diversity in the STEM fields. Also, over time many participants noted increased insight and understanding gained from the workshops. In several evaluations, participants indicated they gained

valuable skills and strategies for initiating change in their units. They also emphasized the importance of their new awareness and clarity of the challenges. In the earlier workshops (2009), many noted that they would implement change in their units, taking into account workshop materials, but that they needed more time to develop relationship/communication skills to be successful in leading change.

After the workshop focusing on whether CEOS made a difference, participants reported they gained insights into how other units operationalize best practices for mentoring and transparency. Many of the respondents shared they would be changing the way female and associate professors are treated in their departments/colleges and also reported they would be changing the decision making process in their units. Over time, an increasing number of the respondents indicated that they were making changes aimed at transforming the cultures of their units.

PEER MENTORING CIRCLES

Peer mentoring circles for tenured STEM women faculty were established as part of an initiative to offer women leaders opportunities for solving problems and building community with the goal of **retaining STEM women faculty**.
In invitations to participate, the purposes of the peer mentoring circles were stated as:
- Offering a safe, confidential forum for dialogue, reflection, and the exchange of ideas;
- Encouraging career and life goals; and
- Supporting participants in taking focused and purposeful action in response to the challenges they face.

Originally, twelve to fifteen women composed a circle with each circle having a mix of women from the three colleges of Biological, Mathematical and Physical Sciences (BMAPS), Engineering, and Veterinary Medicine, and a mix of Associate and Full Professors.   In the first year of the project, three circles met monthly, each for a two-hour period, facilitated by a consultant from outside The Ohio State University.

Initially, the circles were arranged loosely, with participants largely setting the agenda and the consultant providing facilitation and support. Feedback from the participants resulted in a change in structure. Starting in October 2010, the facilitator has been providing more purposeful direction to the circles. She prepares materials on topics previously identified in circle discussions and presents strategies for addressing them. Member information and personal experiences are used to highlight examples and encourage meaningful discussion of topics. In addition, the three circles were consolidated into two with each meeting once per month. Whereas early circles had assigned membership, participants in subsequent circles have not been assigned to any of the particular circles but have been expected to attend one of the two meetings each month. Since both meetings in a given month are on the same topic, this is believed to have eased the scheduling constraint felt by many of the participants while ensuring that all members receive the same level of support regardless of which circle they attend.

Participation

In Spring 2009, all ninety tenured women faculty in the three Colleges of BMAPS, Engineering and Veterinary Medicine were invited to participate in a circle. Thirty-nine women expressed interest in participating and did participate in at least one circle meeting in Summer 2009. Thirty-two of the thirty-nine continued to participate in Fall 2009. An additional ten women were recruited, increasing the number of Fall 2009 participants to forty-two. By the end of Spring 2010, thirty-one women remained active participants. A year later, in June 2011, twenty-two women were participating in the circles.

In late Fall 2009, and again in June 2011, the reasons why women had dropped out of the circles were investigated. In the majority of cases, the reasons involved lack of time and/or scheduling conflicts. While only one respondent who stopped attending in 2009 claimed to have felt uncomfortable with the atmosphere of the circles, eight (42%) of those who dropped out and responded in 2011 reported being uncomfortable and not benefiting from attending. Other reasons for non-participation in 2011 included difficulty sharing information with colleagues from the same department and expressed need for greater focus on peer mentoring within the group.

Questionnaires

At the end of Fall 2009, participants were asked to complete a ten-item questionnaire; 64 percent of participants responded. At the end of Spring 2010, participants were asked to complete a sixteen-item questionnaire; 48 percent of participants responded. In June 2011, we administered a fifteen-item questionnaire and 68% of those participating responded.

From the three questionnaires, three repeated items reflect significant value of the circles:

Item	Dec. 2009	June 2010	June 2011
	% Agree/Strongly Agree		
I am personally benefitting from participating in a circle.	78%	100%	80%
I am professionally benefitting from participating in a circle.	50%	60%	74%
Participating in a circle is a valuable use of my time.	75%	80%	94%

While perception of personal benefit from circle participation increased from December 2009 to June 2010, and then decreased by June 2011, it nevertheless remained relatively high over the three time periods. Professional benefit from participating in a circle increased steadily over time, as did the participants' assessment that taking part in a circle is a valuable use of their time.

From the 2010 and 2011 questionnaires two items are salient indicators of the impact of participation in the circles on retention of women faculty in STEM fields:

Item	June 2010	June 2011
	% Agree/Strongly Agree	
My sense of OSU as a supportive community has strengthened as a result of participating in a circle.	47%	53%
Participation in a circle has increased the likelihood that I will stay at Ohio State.	28%	40%

As these results indicate, the mentoring circles led to a more positive perception of Ohio State for many participants and over time increased the chances that they will remain at the university.

From the open-ended responses it is clear that circle participants' expectations shifted over time. In the first administration of the questionnaire, responses to "My experience in the circle can be strengthened by…," a majority of participants focused on personal changes (e.g. "Trying to find a time when I can attend") or on the participation of others (e.g. "More constructive thinking by some participants"). In contrast, the second survey responses articulated a clear desire for more structure and facilitator involvement. This desire was reinforced in participants' discussions with the External Advisory

Committee in July 2010 and led us to alter the structure of the circles. The third survey responses indicated that participants liked the more structured format and were interested in finding effective avenues for communicating their issues and concerns to department chairs and college administrators. A workshop for Deans and Chairs with mentoring circle participants was organized to respond to this need. Also, issues and concerns identified by circle participants were incorporated into discussions by the three Action Learning Teams.

Essays

At the end of Spring 2010, participants were asked to submit a reflective essay, answering the question, what have you gained personally and professionally from the Peer Mentoring Circles? Eight (25 percent) reflective essays were received in which participants identifies both benefits and concerns. Among the benefits perceived as a result of taking part in the circles the participants mentioned: networking/connecting with women in other departments/colleges (3); meeting other women in similar career and life stages (3); hearing from Department Chairs (2); receiving valuable advice; seeing that others have similar problems/issues/questions (2); gaining perspective on the situations that others have encountered (2) and gaining social experience/opportunity (2). Some of the concerns expressed by participants were: In the first session participants were encouraged to reveal personal and emotionally unsettling/troubling experiences/too intimate for an initial conversation (2); attendance (2); lack of commitment from members; domination within a circle by 1-2 members; circle reinforced frustrations and realizations about serious systemic problems; sessions lack structure; and an inability to communicate about feeling overworked/burned out to those outside the circles.

The facilitator was perceived to have a great fund of knowledge, valuable experience outside of academia, and was seen as helpful in contributing current "thinking" as well as in her constructive approach to looking at problems and situations. Participants indicated, however, that they would have appreciated more input from the facilitator and more topic related discussions.

As indicated above, the participants' feedback was used to restructure the mentoring circles.
At the close of the academic year in 2011, reflective essays were again collected from 2010-2011 participants. A total of five essays were received. As in 2010, the participants listed both benefits and concerns that arose from their participation in the circles. Regarding advantages of the circles, the participants noted that the circles provided a safe and supportive environment and the women benefitted from hearing both the advice and the concerns of women in different ranks. The participants also appreciated hearing other women speak about successes in difficult work situations. An additional benefit to participating in the circles was that it helped the women to understand their role at the University level. As noted in 2010, the participants in 2011 were also satisfied with the work of the facilitator. Specifically, participants explained that the facilitator pushed them to explore the ways in which they approach problems and difficult situations and challenged them to think about their work in new ways.

Regarding concerns with the circles, the participants mentioned that there was a sense of frustration that arose from the content of the conversations and that there needed to be a more proactive stance in the conversations on what the University might do to improve the climate for women. Despite liking the new structured approach, the participants noted that they wanted to have more time for social interactions during circle time.

PROJECT REACH

As part of its overall goal to enhance the success of women faculty in the STEM disciplines (science, technology, engineering, and mathematics), CEOS has designed a series of four workshops to help faculty explore the potential of commercialization as an alternative avenue for their research results. Each woman wishing to participate in the series must be nominated by her unit head and funded (a nominal $400 cost) by her dean. This is done to ensure that there is a sense of importance in this program, not only for those participating but also in the eyes of University leadership. However, there was one instance in which a faculty member was unable to get the approval of her dean. We made an exception to allow her to participate despite this issue and she funded herself through her grant activity. This policy has been generally well received by OSU leadership, and it is our perception that participation is marked with some prestige.

To date there have been two cohorts of faculty to complete the REACH series. The first took place in the first half of 2010 and the second in the first half of 2011. Because of the small numbers of women faculty in STEM at OSU, we opened up participation in this program to all fields that could be considered STEM+ even if they are not included in one of our participating colleges. Finally, also due to concern about small numbers, it has been decided not to pursue a third cohort of REACH participants but to instead host a regional REACH conference in 2012.

2010 Cohort

There were eleven women faculty in the initial cohort of participants in REACH. Feedback on each workshop was gathered from the participants and helped to inform the design of the workshop series for the second cohort. The main change resulting from the feedback was to switch the order of the last two topics. (For a full review of the feedback received from the first REACH cohort please refer to the 2010 Mid-Project Research Report.)

Self Assessment
In addition to feedback on the series, participants were asked to respond to a self-assessment questionnaire based upon the Entrepreneur-Management Assessment Questionnaire.[2] This was done at entry, exit, and at a one year follow-up.

The pattern of responses to the REACH entrepreneurial self-assessment questionnaire fall into three categories: (1) continuous improvement over the past year, (2) an initial decrease upon completion of the workshops followed by an increase over the year since completion and (3) an increase after completion of the workshops followed by a decrease in the year since completion. Those with continuous increases demonstrate that the workshops not only helped participants immediately but also encouraged them to continue improvement on their own throughout the following year. However, those areas in which initial gains were then followed by decreases in confidence or knowledge indicate the need for continued support as a means to reinforce initial lessons. Finally, those areas in which marked decreases were noted at the end of the workshop series but which later rebounded suggest that workshop content may have initially shaken some participants' confidence. Apparently, however, this concern has decreased with time.

Those areas with continuous improvement include: having collaborators in industry, familiarity with OSU Tech Licensing, obtaining industrial funding, a sense of reliability and self as change agent. The fact

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[2] Ian Deamer and Louise Earle. "Searching for Entrepreneurship" in *Industrial and Commercial Training*. Vol. 36, Issue 3, pp 99-10.

that there were large gains in these areas indicates that participants have not only learned from the workshops but also begun putting the information into action. Especially notable are the changes in those reporting an increase in agreement with the statements "I have collaborators in industry", "I have a wide range of professional contacts outside academia", and "I have obtained industrial funding."

Many of the statements related to characteristics of self (e.g. "I am ready and willing to be a jack-of-all-trades," "I have a high level of flexibility", and "I am alert to new opportunities,") saw dramatic decreases at the conclusion of the REACH workshops. However, these decreases were not permanent; all of them rebounded at least slightly by the one year follow-up. This suggests that perhaps the workshops had the effect of causing women to doubt their characteristics by providing a high degree of information about the requirements and obstacles to entrepreneurship. Two-thirds of the statements that displayed this pattern of response were improved in the one-year follow-up not only over the exit survey but also over the initial responses before the start of the workshops. In addition, the remaining third of these statements rebounded slightly from the low post-workshop rating. This pattern may indicate that as participants put REACH information into practice (as we suggest above) they regain and even improve upon their initial self-assessments. Entrepreneurship may be intimidating when first presented to participants, but it is well within reach for these women.

Despite apparently beginning to work with industry and regaining confidence in their own abilities, there appears to be a pattern of initial gain followed by disagreement with statements concerning specific skills. These statements include "I am comfortable making decisions under complex, uncertain conditions," "I have good self-presentation skills," "I know how to build a team," and "I am familiar with the business world." This pattern, first, reinforces the understanding that women's interactions with industry can often leave them feeling rejected and less capable of pursuing entrepreneurship successfully. Women felt more knowledgeable and capable in these areas after leaving our workshops, but as they have begun to interact with the business world they once again feel adrift. Second, this pattern indicates areas where REACH should seek to continue supporting and informing participants. Continued programming, such as quarterly workshops or networking lunches, should focus on these areas in order to ensure that the initial gains of REACH participation are not lost.

2011 Cohort

Additional eleven participants took part in the 2011 series of workshops. Shortly after the start of the series, however, one of the participants became quite ill. She was able to attend the final workshop and received the materials from all of the workshops, but missed a substantial section of the series.

Like the previous cohort, the 2011 group was asked to provide feedback on each of the four workshops and complete an entry and exit self assessment questionnaire.

Workshop Feedback

*Visioning Social Impact for Research (*February *4, 2011)*
There were 10 total feedback responses. 5 of the participants stated that they were "Very Satisfied" with the workshop. The remaining 5 responded that they were "Satisfied." When asked about the level of importance of the workshop, 5 responded that it was "Very Important" and the remaining 5 noted that it was "Important."

The respondents were also asked "What did you gain by participating in this session?" Several participants stated that they gained from learning about others' experiences and hearing about their successes in commercialization. The participants noted that as a result of the workshop, they now had a better understanding of "where the university is at in terms of commercialization" and the "university's

new plans for handling IP and commercialization." The participants noted that they were able to receive information about Tech Licensing procedures as well as any changes to the Tech Licensing process. Workshop participants mentioned that it was valuable to have the opportunity to "directly interact with the leadership." It was particularly interesting to hear the "VP for Research talk about changes that are being implemented to help with the 'invention and beyond' steps." Participants also acknowledged that it was beneficial to get to know peers, establish contacts, and build networks. Overall, participants stated that it was exciting to not only learn that their ideas could be taken to another level, but to understand how to possibly commercialize their ideas. On a personal note, participants responded that they felt encouraged and understood that support did exist.

Workshop participants also were asked "What skills, tools, or resources do you need to excel in your communication efforts?" The responses included funding for up-scaling of products and access to more resources. In regard to technical support, it was noted that there needed to be a "faster response time from tech transfer office, more contact with tech transfer/licensing staff and more flexibility from tech licensing." The respondents also noted that they needed more support to be able to spend more time on their independent projects. Need for more information in the following areas was also mentioned: business management and marketing, patent procedures, licensing, understanding the flow of the OSU process, and how to contact companies about their licensing processes. Two respondents also stated that general information about "everything" having to do with commercialization would be valuable with one participant replying that even though she had "never done this before," she "can't wait to begin."

Capitalizing on OSU Tech Transfer Resources (March 4, 2011)
There were 9 total feedback responses. Of that number, 6 stated that they were "Very Satisfied" with the workshop, 2 replied they were "Satisfied" and one replied "Neutral." 4 of the attendees stated that the workshop was "Very Important," another 4 noted that it was "Important," and one replied "Neutral." When asked "what did you gain by participating in this session?" three respondents answered that the information they learned was useful as it made them think about what aspects of their research could potentially be patented, while also equipping and challenging them to think about the value of having a patent for ideas that are not mature enough for commercialization, but also understanding the "importance of having a very clear path to commercialization." The attendees stated that as a result of the workshop they were able to gain a "better understanding of relevant procedures and processes for licensing and patenting." Additionally, it was noted that they were able to become more familiar with "University resources, contacts, and lots of do's and don'ts." They also mentioned being able to establish good contacts with TL&C.

Building Awareness and Skills for Collaboration (April 8, 2011)
Out of the 9 attendees, 5 stated that they were "Very Satisfied" with the workshop, 4 stated that they were "Satisfied." 5 also replied that they felt the workshop was "Very Important," 3 noted that it was "Important", and one replied "Neutral." When asked "what did you gain by participating in this session?" 3 respondents noted that they learned more about focusing on their "vision", "thinking", and "what is important." Five respondents replied that they were able to learn more about some form of "strategic planning" such as being able to "plan in doable steps," "set a goal," "evaluate [their] situation," "set deadlines," as well as "think about prioritizing [their] time." One attendee answered that she was able to understand about her own "strengths and weaknesses more by talking to other colleagues." One attendee replied that she learned about "communicating business." 2 respondents stated that they "learned a lot of practical tools that [are] most useful at this stage of [her] career," another simply replied that she learned "very useful tips." One last respondent stated that "this was one of [her] favorite workshops thus far."

Stepping Out and Building a Network (May 6, 2011)
There were 5 total feedback responses. All 5 of the respondents replied that they were "Very Satisfied" with the workshop; all 5 respondents also noted that the workshop was "Very Important." When asked "What did you gain by participating in this session?" the respondents replied that they were able to "learn about funding resources" and "about an area where they had no knowledge" as well as gain a "real insight into the world of seeking investors." They noted that the information shared by the women faculty about their experiences in this area was "valuable." One respondent replied that while she already had "background in this area," the workshop was "very well done."

Self Assessment

Initial results suggest that the 2011 cohort's responses to the self assessment follow the same patterns as the first cohort thus far. However, as a result of the 2010 pattern at follow-up, a quarterly networking and refresher workshop for all REACH participants began in January 2012. The 2011 cohort will be contacted for a one year follow-up in the summer of 2012.

University-wide Entrepreneurship

CEOS has recently partnered with the Office of Technology Licensing to begin reviewing data regarding disclosures and patenting at the University. Thus far, all of the patent applications filed have been identified and coded by gender. (See Appendix B for these data.) The next step in this process is to code them by unit so that we may identify patent activity in our CEOS and STEM fields specifically.

Another recent activity undertaken at OSU is the review of tenure and promotion guidelines. Our Provost of Academic Affairs and Co-PI, Susan Williams, is among those working to rewrite the documents. Among the changes being discussed is language supporting the recognition of commercial activity in promotion and tenure review. This document is scheduled to be released in 2012.

ACTION LEARNING TEAMS

The action learning teams have been trained in action learning approaches and techniques and began initial meetings in early 2011. The teams are aided in large part by the Office of Human Resources, which has provided well-trained facilitators who guide our teams through action learning processes. The teams were given suggestions of topics to address, which came about as the result of a deans and chairs workshop in fall 2010. These suggestions, along with information and support from the CEOS staff, have helped to frame much of the discussion.

Thus far, the Natural and Mathematical Sciences (NMS) team is the most active, having identified a plan of action and set a tentative schedule to move forward. The Engineering team has met several times and has been working diligently to form its vision for action. The team members have reported that they have identified the problem area for action but not yet set a plan to address the issues. The Veterinary Medicine team has been challenging because the college already had established a number of committees committed to addressing culture issues within the college. Nonetheless, they hope to begin working on an issue aligned with CEOS in 2012.

Natural & Mathematical Sciences Division

The Natural and Mathematical Sciences action learning team was appointed by Dean Peter March in autumn 2010. Its charge, developed in consultation with the CEOS Project, is to identify climate or

culture issues at the college or departmental level, develop strategies and implement action as a group to solve problems.

In the following sections of this summary we provide a description of the process used to identify and frame the problem, formulation of goal/objectives and the working action plan for implementing solutions.

Framing the Discussion and Setting the Agenda
The team spent most of its first year learning and discussing data on climates within science departments at OSU. Sources of information included:
- Demographic data on faculty by rank, gender, and department
- Institutional Reports (the Zacher report, Faculty Survey results)
- Results of CEOS workshop held in summer 2010
- Review of the literature on fairness and transparency

Data from Ohio State show some important patterns:
1. Like most research universities, women are under-represented on the faculties of most STEM departments, with most women in lower ranks.
2. The patterns of faculty flux show that women in STEM departments leave more often than men.
3. Women are over-represented among Associate Professors and take longer than males to earn the next promotion to Professor.
4. Ohio State has more faculty than our peers and aspirational peers at the Associate Professor rank for 10+ years.

Formulating Goals and Objectives
The Team discussed issues raised by the data, as well as additional insights from their personal experiences. Perceptions of fairness and transparency of rules emerged as a major theme that led the team to focus on how departments can limit feelings of marginalization and perceived unfairness, particularly for women and faculty of color.

The critical time period for these issues to emerge in faculty careers at OSU is the Associate Professor stage. As an institution, Ohio State has very few guidelines for requirements for promotion to full professor, there is no mandated post-tenure review, and most departments have no mentoring structure for Associate Professors. By contrast, well developed mentoring programs exist for Assistant Professors. Thus the team identified a primary objective for their work: to develop **a mentoring program for Associate Professors** that will encourage them to progress towards the next promotion.

After identifying a need for mentoring Associate Professors, the team began to brainstorm about how mentoring should be implemented for this population at OSU. Specifically the group asked questions such as: What do Associate Professors need to know for promotion to full? How can departments provide incentives for Professors to mentor Associate Professors? What does the rewards/accountability structure for this type of mentoring look like?

Action Plan
The team has written a report summarizing the need for a mentoring program and outlined features of the program in its report. The team members will present this report along with best practices to the College Dean and Department Chairs at an Executive Chairs meeting. The team will also present their ideas to senior faculty in all departments in the division of NMS and ask for feedback on the mentoring plan to accrue buy-in for institutionalizing this plan throughout the college.

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College of Engineering

The College of Engineering Action Learning Team met during the spring of 2011 and reviewed literature on culture/climate issues at OSU. However due to ABET accreditation, meetings were put on hold. The team reconvened in January 2012 and has been working on identifying a focus and developing an action plan.

College of Veterinary Medicine

The methods and implementation of the Veterinary Medicine Action Learning Team are slightly different from the other two teams. The College already had cultural change teams in place prior to the appointment of CEOS action learning teams; therefore, those cultural change teams will serve as action learning teams for the purpose of this study. To date, the Vet Med "Action Learning Team" has identified a visionary area that aligns with CEOS goals of cultural change. The Dean of Vet Med will appoint a committee to investigate this issue further and the team will begin their work in spring 2012.

INSTITUTIONALIZATION

An important outcome for the ADVANCE program is that the University incorporate the best practices and lessons learned into its regular operations . Over the past four years we have learned that family friendly policies, equity across the genders in terms of salaries, startup packages, laboratory space, and similar, relatively easy to incorporate measures, already exist at Ohio State. However, considerable work remains to be done before the University can claim to have achieved a level of sensitivity to the various needs of a truly diverse workforce so that not only policies and procedures are welcoming of all comers, but so is the culture.

The focus of CEOS has been on four areas:
- Leadership development
- Peer Mentoring Circles
- Project Reach
- Action Leaning Teams

In each of these areas, we have begun to institutionalize best practices that have emerged over the first four years of the project.

The leadership development seminars and training activities conducted by CEOS are being incorporated into the Academic Leader Development (ALD) seminars for deans, associate and assistant deans, department chairs and school/center directors. Academic Leader Development offered by the Office of Human Resources in collaboration with the Office of Academic Affairs consists of a series of seminars over the course of a year that address such issues as leader roles and responsibilities, promotion and tenure, faculty review and development. They are developed with the goal of promoting more inclusive and transparent departmental and college cultures. As a result of Project CEOS's focus on women and underrepresented minorities, the ALD seminars have become more oriented toward diversity

A potential permanent home for the peer mentoring circles is The Women's Place. It was created in 2000 to improve the climate for women on campus and now serves as a catalyst for institutional change to expand opportunities for women.

The University has recently consolidated various offices that bridge the gap between the workbench and the marketplace by creating the Technology Commercialization Office. This office is a natural place to

locate the activities of Project Reach. Initial discussions are underway regarding how the activities of Project Reach can be folded into the Technology Commercialization Office.

Action Leaning Teams were created last fall and we are still in the process of learning about their role in bringing about institutional change.

Reliable data play a major role in determining the efficacy of efforts to bring about institutional change. The University regularly surveys the faculty on various aspects of university life. Every effort will be made to ensure that such surveys as well as the CEOS efforts at data collection continue beyond the duration of Project CEOS.

CONCLUSION

This document represents a descriptive summary of Project CEOS findings from January 2009 until December 2011. At this time we are not able to make major claims about the impact of any one of our programs on Ohio State as an institution. However, our findings indicate that the Leadership Training for Deans and Chairs, Peer Mentoring Circles and Project Reach programs have had positive effects on their participants. These findings support and inform our efforts moving forward. This document is likely to be used to inform future workshops, interviews, focus groups and the efforts of our Action Learning Teams. It is intended to be updated as more data are collected and analyzed.

Logic Model, July 2010

Inputs	Outputs	Outcomes — Short-Term	Outcomes — Medium-Term	Outcomes — Long-Term
Workshops for Deans and Chairs	Consent Forms Toolkits Active Discussion Attendance at quarterly meetings Leadership Inventory (Pre and Post) Interviews Completed	Awareness of cultural assumptions Skills to effect change Think critically about the workshop materials Articulate the benefits and problem areas of the workshops	Sustained discussion of cultural assumptions Commitment to alter institutional culture and policy Receive improved/targeted workshop training in the future Continue to discuss workshop material outside of the workshop context	Permanent change in department/college culture Changed institutional policy Increase ability to identify and alter institutional policies that are not culturally sensitive Increase commitment to be continuously aware of cultural assumptions
Action Learning Teams	Deans appoint team Portfolios/Action Plans created Quarterly meetings held and attended	Think critically about the culture problems of their specific Department Sustained discussion among members of different departments about culture issues	Work collaboratively to find and implement methods of addressing culture issues	Permanent change in department/college culture Changed institutional policy

Inputs	Outputs	Outcomes		
		Short-Term	Medium-Term	Long-Term
Peer Mentoring Circles	Held Monthly	Opportunity to share concerns and experiences	Increase feelings of support	Retention of women faculty
	Attended regularly	Meet other women in STEM	Increase professional connections	Increase interdisciplinary opportunity
	Consent forms			
	Active discussion	Learn new strategies for handling problems	Apply new strategies for handling problems	Increased success & productivity of women faculty
	Journals	Reflect on personal growth, coping and leadership abilities	Take on mentoring roles outside the circle	Create a supportive institutional culture
	Annual Response Essays		Feel empowered to take on new roles	More representation of women in leadership roles
	Surveys/ Questionnaires	Think critically about the benefits and problems of peer mentoring	Adjust the format and/or content of circle discussions	
Entrepreneurship Workshops	Attended regularly	Learn about opportunities for entrepreneurial activity	Increase entrepreneurial activity among STEM women	Increase entrepreneurial success among women
	Consent forms	Learn skills for successful entrepreneurship	Increase demand for institutional support of entrepreneurial activity	Increase institutional support for entrepreneurship
	Self assessment (pre & post)	Learn how to translate academic success into entrepreneurship and vice versa		Increase institutional and cultural recognition of entrepreneurial success
	Evaluations, Surveys, & Follow-up			

## Number of Patent Applications by Gender
2005-2011

Year	Male	Female	Total	Total University Male Faculty	Total University Female Faculty
2005	531	125	656	2345	998
2006	544	99	643	2350	1064
2007	501	114	615	2446	1125
2008	536	136	672	2462	1182
2009	573	126	699	2492	1249
2010	481	98	579	2491	1276
Total	**3482**	**753**	**4235**		

Number and Percentage of Patent Applications by Gender (2005-2011)

Year	N of Male Patent Applications	Total N of Male Faculty in University	Percentage of Male Applicants	N of Female Patent Applications	Total N of Female Faculty in University	Percentage of Female Applicants
2005	531	2345	22.64%	125	998	12.53%
2006	544	2350	23.15%	99	1064	9.3%
2007	501	2446	20.48%	114	1125	10.13%
2008	536	2462	21.77%	136	1182	11.51%
2009	573	2492	22.99%	126	1249	10.09%
2010	481	2491	19.31%	98	1276	7.68%

Percentage of Patent Applications by Gender (2005-2011)
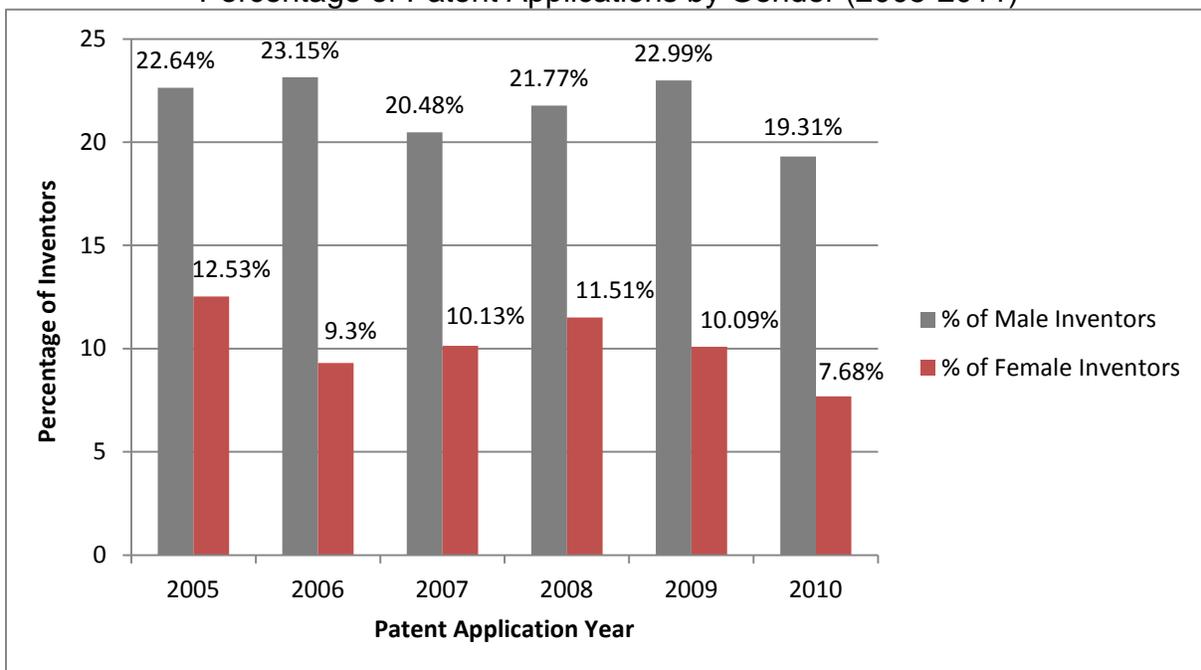
Number of Patent Applications by Gender (2005-2011)
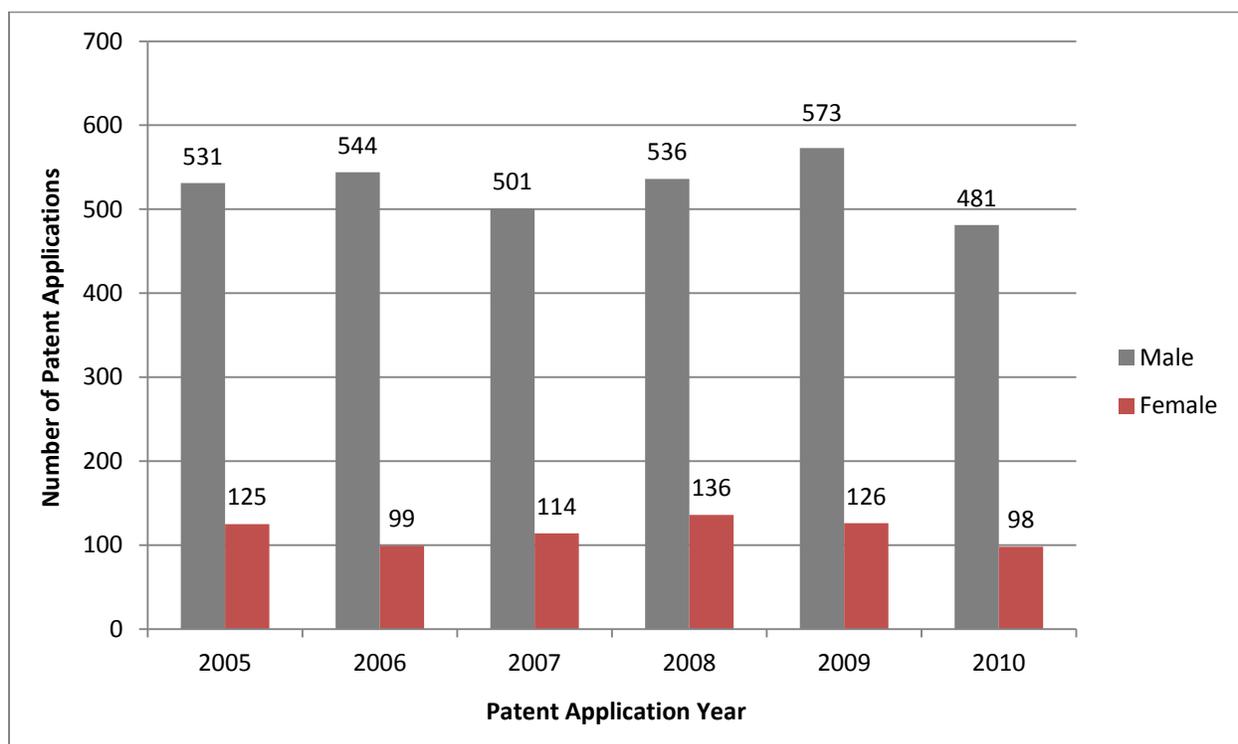
Number of Patent Applications by Gender (2005-2011)

Patent Applications by Gender