

Project Description

I. Introduction

Middle Tennessee State University (MTSU), the largest public university in Tennessee, an EPSCoR state, proposes to conduct a self-assessment study to review the status of women faculty in academic STEM disciplines on our campus. **This study, *A Catalyst to ADVANCE the Participation and Advancement of Women in Academic STEM Careers at Middle Tennessee State University*, will focus on identifying barriers that affect recruitment, retention, participation and promotion of women STEM faculty at MTSU.** The purpose of self-assessment study will provide insight on the campus climate for women STEM faculty and administrators as well as answers to the following questions for our campus:

- What is the distribution of STEM faculty by gender, rank and department?
- What is the gender distribution of STEM faculty in leadership positions?
- What are the outcomes of the tenure and promotion process for all STEM faculty?
- What is the allocation of resources (e.g. salary, space and start-up packages) for STEM faculty by gender?
- What are the processes that lead to divergent outcomes and resource allocation by gender in STEM disciplines at MTSU?
- Which policy changes could be implemented to improve the recruitment, retention, and promotion of STEM women at MTSU?

Our overarching goal is to identify the barriers and then implement best practices for the recruitment, retention and promotion of women STEM faculty that will promote gender equity at MTSU. We have collected data for academic years 2010 to 2012 addressing our first two questions in anticipation of submitting this proposal. In order to have excellence in education, which in turn leads to a diverse STEM workforce, it is essential that MTSU is a welcoming and diverse workplace for ALL faculty in STEM.

The 2011 report, “Women in STEM: A Gender Gap to Innovation,” notes that there are many factors which contribute to the low numbers of women in the STEM workforce which includes academe [1]. These factors include the absence of women role models, mentors, and the lack of family-friendly practices in the workforce. Trower and Chait of COACHE, Collaborative on Academic Careers in Higher Education, administer the “Tenure-Track Job Satisfaction Survey” to full time tenure track junior faculty. They found that women STEM faculty were dissatisfied with the “fit” or “climate” in their department and with the lack of family friendly practices in their institutions [30, 32]. The importance of both informal and formal mentoring was also mentioned as vital to surviving the tenure ladder [8, 30, 32]. Kulis proposes that the gender gap in science faculty may be due to differences in academic cultures [10]. Hurtado and DeAngelo note that “institutions still need to focus on the advancement and retention of women at the highest academic ranks” in all disciplines [9]. Xu reports that men and women are committed as STEM faculty, but women had a greater likelihood of leaving due to dissatisfaction with research support, lack of advancement opportunities and “free expression of ideas” [33].

The climate for women faculty in STEM is changing but not fast enough as shown by the question recently posed by Eileen Pollack in the New York Times: *Why Are There STILL so Few Women in STEM?* [25]. It is time to fulfill the potential of women in academic STEM disciplines at MTSU, in Tennessee and in our nation [17]. Yet barriers are still prevalent [8, 17, 18, 20]. The National Research Council stated that women who earn doctorates in STEM were less likely to apply for academic research jobs because of concern about the tenure-track process in higher education [18]. In one study, research intensive universities are considered the least family-friendly by both male and female doctoral students. This study also suggests that women

who do not have children early in their career are likely to earn tenure [13]. On September 26, 2011, at the White House, NSF announced its Career-Life Balance Initiative, which is designed to support scientists who are juggling both research and family [19]. This announcement quickly followed the research on family-friendly practices published by Ecklund and Lincoln [5]. The move by NSF to bring a family friendly culture to the STEM research community is a tremendous step forward and provides momentum for institutions to evaluate and change policies that hinder the advancement of women in STEM.

In 2010, women earned 50.3% of the bachelor's, 45.5% of the master's and 41.0% of the doctorate degrees in STEM. Data also show that 40.6% of the assistant professors, 33.8% of the associate professors and 19.3% of the full professors in STEM fields were women [21, 22]. However, these numbers do not necessarily translate to an increase of women faculty and administrators in STEM in higher education. Overall, 32% women STEM doctorate holders were employed in universities and four-year colleges [21, 22]. Studies by Burrelli [2, 3] Rosser [26, 27], Nelson [23, 24], and Kuck [11,12] note that the percentage of female STEM faculty hired is less than their proportion in the corresponding doctoral pool. According to Nelson, women were 44.7% of the biological sciences Ph.D. recipients between 1993 and 2002, yet only 30.2% were hired as assistant professors while white men received 43.2% of the Ph.D. degrees and 55.4% of the faculty jobs [23, 24]. Faculty positions in STEM also escape women of color [3, 6, 23, 24, 27]. Recruitment, retention and promotion policies must change for women STEM faculty if parity is to be achieved in hiring, retention and promotion [4, 8, 11, 12, 20, 23, 24, 33].

Barriers are being addressed by ADVANCE Institutional Transformation Catalyst (IT-Start) programs across the United States. Several programs such as those at the University of Colorado at Denver (#1008026) and University of California Merced (#1008044) are collecting baseline data to quantify the status of women in STEM disciplines. Other programs such as those at the University of South Carolina (#1008336) and Eastern Washington University (#1008027) seek to identify barriers to the retention and advancement of women STEM faculty. Also of interest are the programs of Southern Illinois University at Edwardsville (#1008696) and Tennessee State University (TSU) (#1008738), both universities undergoing transitions similar to that of MTSU. Keith Hargrove, PI of the TSU ADVANCE program, has agreed to serve on the External Advisory Board for the MTSU ADVANCE project. MTSU is poised for change and eager to commit to specific goals based on the results of this study.

The **intellectual merit** of the proposed study will advance knowledge about the participation and advancement of women in academic STEM careers at MTSU. We will build upon previous research from similar ADVANCE institutions including that of Tennessee State University, the only other ADVANCE institution in Tennessee. Our data-driven study will provide us with a clear understanding about the climate for women STEM faculty on our campus. Lessons learned and best practices identified from this work will help us identify and understand barriers which hinder the advancement of women STEM faculty through the tenure and promotion process and into academic leadership positions. Our data will provide other Tennessee institutions, particularly institutions in the Tennessee Board of Regents system, the sixth largest system of higher education in the United States, with a blueprint for similar studies and with strategies to increase the participation, retention and advancement of women STEM faculty in institutions undergoing rapid growth and change.

The **broader impact** of this project is tremendous in terms of the number of women in academic STEM careers and the impact they will have on the STEM workforce. We anticipate that the results of our study will benefit all faculty and administrators including those underrepresented in STEM on MTSU's campus, in Tennessee, and throughout the south. In turn, a stronger and more supportive climate for all faculty will lead to a robust campus climate for STEM majors, especially women, who often are deterred from pursuing STEM careers due

to the lack of role models and a supportive environment. As the fastest growing higher education institution in Tennessee, it is clear that findings from MTSU will support an inclusive and diverse STEM workforce as well as a model for faculty leadership development beyond our campus. **The results will be shared with MTSU's governing board, the Tennessee Board of Regents, the sixth-largest system of public higher education in the United States,** and the 46 institutions of public higher education institutions it governs. The results from project could impact the gender equity policies at these 46 public institutions (6 universities, 13 community colleges, and 27 colleges of applied technology) and the 200,000 students they serve annually.

II. Institutional Context and Data

Tennessee. MTSU is located in middle Tennessee which covers the central division of the state. Major interstate connections and close proximity of communities to major cities such as Nashville afford this region opportunity for population growth, economic growth, and attraction of companies for expanded job opportunities. Many biotech companies are located in the middle Tennessee area, including Arnold Engineering Development Center, Hemlock Semiconductor Group, Schneider Electric, and a rapidly growing automotive industry which includes Nissan North America, General Motors, and Bridgestone. Tennessee is rich in STEM employment opportunities; however, the STEM workforce in Tennessee is lacking.

Women in Tennessee account for 51.2% of the overall population with 51.7% of women over age 16 in the workforce. Seventy three percent of the women are high school graduates or higher and 23% of the women in Tennessee hold a bachelor's degree or higher [31]. The wage gap comparing female income as a percent of male income for all occupations in Tennessee is 77%. Women account for 30% of computer scientists, scientists and analysts in Tennessee and earn 85% compared to men in those professions in Tennessee. The highest paid occupation for Tennessee women is engineering with an income ratio of 0.91. However, only 20% of the engineering jobs are filled by women in Tennessee [31]. This is not surprising considering that women constitute 27% of the STEM workforce nationally [21, 22]. Thus, it is critical to advance women STEM faculty who serve as role models and mentors to students in higher education who will be the future STEM workforce.

Middle Tennessee State University. MTSU celebrated its centennial in 2011, and today is the fastest growing institution of higher education in Tennessee. MTSU is one of six universities of the Tennessee Board of Regents system. MTSU is committed to leadership in higher education and promotes a student-centered approach with experiential learning at its core [15]. In Fall 2013, MTSU served 21,162 undergraduate and 2,719 graduate students; 54.33% are female [14, 16]. MTSU is the first choice of undergraduates in Tennessee with nationally recognized programs in aerospace, recording industry and concrete industry management.

Most STEM departments are located in the College of Basic and Applied Sciences, (CBAS). CBAS is made up of a diverse set of departments that includes the basic sciences such as Biology, Chemistry, Physics, Mathematics, and Computer Science, as well as Aerospace, Agriculture, Concrete Industry Management, Engineering Technology, and Military Science. CBAS is the second largest of the university's five undergraduate colleges in terms of the overall number of declared majors; the college has 4375 undergraduates, 347 masters, and 91 doctoral students in Fall 2013 [16]. This college offers 16 undergraduate major programs, including 56 different emphasis areas. Seven of the ten departments within the college offer programs leading to a master's degree, including a growing Masters Professional Science program. The college also offers three interdisciplinary Ph.D. degrees in the areas of Computational Science, Molecular Biosciences, and Mathematics and Science Education. In the 2011-2012 academic year, CBAS conferred 669 degrees [14, 16]. Founded in 2009 in the

College of Basic and Applied Science, the Women in STEM Center (WISTEM) supports female STEM faculty in their academic development and career growth.

Students can also major in psychology, economics, geosciences, political science, sociology, and anthropology. Other than psychology, which is in the College of Behavioral and Health Sciences, the remaining STEM majors listed above are housed in the College of Liberal Arts. Note that the B. S. in Economics is granted by the College of Liberal Arts, but the economics faculty are tenured in the Department of Economics and Finance in the College of Business. Graduate degrees in economics are granted through the College of Business. There are 800 full-time undergraduate students and 19 full-time graduate students in STEM disciplines in the College of Liberal Arts; 1,119 undergraduate students and 69 graduate students in the College of Behavioral and Health Sciences, and 24 graduate students in the College of Business.

MTSU is currently classified as a Doctoral Research University by Carnegie. The move from a Masters Large University to a Doctoral Research University in 2009 has been accomplished through the implementation of Ph.D. programs and an increased emphasis on research. Four of the eight Ph.D. programs are in STEM fields: Computational Science, Molecular Biosciences, Math & Science Education and Economics. The move to Doctoral Research University has increased the importance of research while maintaining a strong teaching tradition. This classification of MTSU has required a change in the evaluation of faculty for promotion and tenure which could have an impact on faculty in the STEM fields, particularly in departments that have been slow to adjust faculty workloads to correspond to changed research expectations. The new focus on research for faculty requires the establishment of professional development and a targeted focus on issues of concern for women STEM faculty as well. This is another indication of the readiness of MTSU for an ADVANCE program.

Women STEM Faculty at MTSU: Table I summarizes MTSU Tenure Track/Tenured STEM faculty data for Fall 2012 by department, rank and gender. As indicated, women comprise 29% of the full time STEM faculty at MTSU. This is lower than the 32% women for full time STEM faculty nationally [21, 22]. In 2012, 26% of full professors, 32% of associate professors, and 33% of assistant professors were women, which puts MTSU below the national average for two of the three ranks. Perhaps most troubling, the underrepresentation of women at the assistant professor level indicates a need to act creatively and aggressively to recruit women in STEM. As biological sciences traditionally attract women, it is surprising to note that women faculty account for only 24% in that discipline. The highest percentage of female faculty in STEM fields is computer science (55%), followed by sociology & anthropology (43%) and Mathematical Sciences (41%). The lowest percentage of women faculty in STEM fields is Physics & Astronomy (11%), followed by Economics & Finance (13%) and Engineering Technology (17%). We point out there was only one female faculty (full professor) in Physics & Astronomy and only two female faculty (associate professors) in Engineering Technology. We also note there are no women at the full professor rank in the departments of Concrete Industry Management, Engineering Technology, Geosciences, and Political Sciences. Although women account for 55% of the faculty in Computer Science, it is a relatively small department with five female full professors and one female associate professor.

The overall MTSU Tenure Track/Tenured faculty data for Fall 2012 (Table 2) for all departments by rank and gender show that women faculty comprise 43% of the faculty, 35% of full professors, 44% of associate professors and 58% of assistant professors. Compared with Table I, this indicates there are significantly fewer women faculty in STEM fields even at the introductory levels where one might expect an increase.

Table 1: Tenure Track/Tenured STEM Faculty by Department, Rank, and Gender, Fall 2012

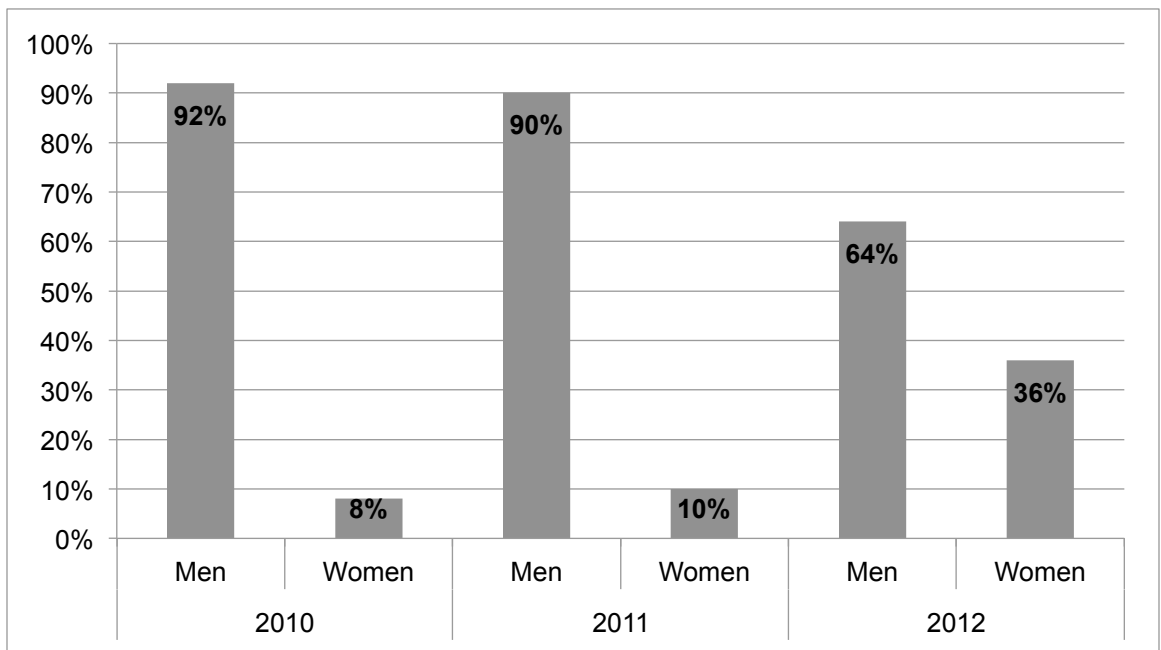
Department	Full		Associate		Assistant		All Ranks	
	Men	Women	Men	Women	Men	Women	Men	Women
Aerospace	2	1	7	1	0	1	9	3
% in rank	67	33	88	13	0	100	75	25
Agribusiness & Agriscience	4	1	1	1	2	0	7	2
% in rank	80	20	50	50	100	0	78	22
Biology	21	3	3	4	5	2	29	9
% in rank	88	13	43	57	71	29	76	24
Chemistry	10	6	7	1	1	0	18	7
% in rank	63	38	88	13	100	0	72	28
Computer Science	3	5	1	1	1	0	5	6
% in rank	38	63	50	50	100	0	45	55
Concrete Industry Man.	0	0	3	1	0	0	3	1
% in rank	0	0	75	25	0	0	75	25
Economics & Finance	9	1	6	1	6	1	21	3
% in rank	90	10	86	14	86	14	88	13
Engineering Tech.	8	0	2	2	0	0	10	2
% in rank	100	0	50	50	0	0	83	17
Geosciences	5	0	2	1	1	1	8	2
% in rank	100	0	67	33	50	50	80	20
Mathematical Sciences	9	7	7	4	3	2	19	13
% in rank	56	44	64	36	60	40	59	41
Physics & Astronomy	4	1	2	0	2	0	8	1
% in rank	80	20	100	0	100	0	89	11
Political Science	7	0	4	2	0	2	11	4
% in rank	100	0	67	33	0	100	73	27
Psychology	14	9	7	3	3	2	24	14
% in rank	61	39	70	30	60	40	63	37
Sociology & Anthropology	7	3	2	3	2	2	11	8
% in rank	70	30	40	60	50	50	58	42
Total	103	37	54	25	26	13	183	75
% in rank	74	26	68	32	67	33	71	29

Table 2: Tenure Track/Tenured Faculty at MTSU by Rank and Gender, Fall 2012

Department	Full		Associate		Assistant		All Ranks	
	Men	Women	Men	Women	Men	Women	Men	Women
Total	210	115	120	93	58	80	388	288
% in rank	65	35	56	44	42	58	57	43

The hiring data in STEM fields for 2010-12 (see Figure 1) indicates that MTSU has hired 44 STEM faculty members over the past three years. The percentage of women faculty hired has increased from 8% to 10% to 36%. Despite the relatively meager number of new hires, this does show commitment and support for participation of women faculty in STEM careers at MTSU.

Figure 1: STEM Hiring Patterns by Gender, 2010-2012



III. Institutional Commitment

This proposed study will ADVANCE many of MTSU’s institutional goals as stated in the Academic Master Plan, *“Building on the Blueprint 2007-2017”* [15]. By focusing on women STEM faculty development and professional growth, this project will “promote academic quality by enhancing learning, teaching, scholarship and service by celebrating MTSU’s distinctive strengths” as well as “promote partnership and public service to enhance educational, social, cultural and economic well-being” [14,15]. Key MTSU administrators from top down (University Provost, Vice Provost for Research, Deans, Directors and Chairs) are clearly committed to this project. The Internal Advisory Board, like a Faculty Learning Community focused on institutional transformation, will identify specific issues of concern and propose strategies for change in order to recruit, retain and promote women STEM faculty at MTSU. It is only with the full participation of women STEM faculty in all aspects of our respective departments and colleges, along with 100% commitment from MTSU, TBR, and THEC governance, our competitive edge in the global STEM community will be realized.

IV. Self-Assessment Activities Description

The goal of our project is to identify best practices for the recruitment, retention and promotion of women STEM faculty and thus promote gender equity at MTSU. Our self-assessment study will provide insight on the campus climate for women STEM faculty and administrators. The activities will be directed by the Project's Leadership Team (PLT) composed of the PI and co-PIs and will begin by providing answers to the following questions:

- What is the distribution of MTSU STEM faculty by gender, rank and department?
- What is the gender distribution of MTSU STEM faculty in leadership positions?
- What are the outcomes of the tenure and promotion process for MTSU STEM faculty?
- What is the allocation of resources for MTSU STEM faculty by gender (e.g. salary, space and start-up packages)?
- What are the processes that lead to divergent outcomes and resource allocation by gender in STEM disciplines at MTSU?
- Which policy changes could be implemented to improve the recruitment, retention, and promotion of STEM women at MTSU?

Collection, Analysis and Synthesis of Institutional Data: The first step was to collect the necessary institutional data from the different organizations and departments on campus. As Tables 1-2 and Figure 1 above indicate, we have that data for 2010-2012 and will expand for 2013-2015. These data have given us an indication of where our strengths and problems lie -- for example there is a significant gap in leadership positions held by women, hiring of women faculty seems to be on the rise, but not to equitable levels, and women in STEM are not advancing to the highest levels as consistently as are men faculty -- but do not give us answers or clear insight into why the differences exist or what direction we must take for change. Further, we did collect some data about start up packages as they varied across campus, but no clear pattern could be discerned without discussion with faculty newly hired and the expected "standard practices" as they vary across discipline and college. We do not have information yet as to allocation of lab and classroom space for STEM faculty. It is important to point out at this time that MTSU is building a new multi-million dollar science building that is set to open Spring 2015. Occupation and use of this new building will give us an opportunity to observe and potentially impact the gender equity of lab and classroom space allocation. As collection of institutional data has been step one, it has led us to our next phase that is the crux of our proposal. Phase two of project includes the collection of additional demographic data in conjunction with the conduct of a campus climate survey, focus groups and face-to-face interviews.

As stated, the Project Team proposes a mixed methods self-assessment project which includes the collection and analyses of faculty data for tenure and promotion, salaries, campus climate, including recruitment and retention issues and strategies, resource allocation, and career advancement policies. The quantitative and qualitative information will provide both an overall picture of the climate at MTSU and an in-depth understanding of the issues involved. We will identify barriers that prevent women from moving into and up the academic career ladder. Knowing that successes do exist, best practices and lessons learned with respect to career advancement at MTSU will be identified and shared with the TBR system and other institutions as well. All data will be collected in compliance with IRB procedures, paying particular attention to consent, confidentiality and anonymity as necessary.

Campus Climate Survey. Based on our literature review and the issues raised in our discussion of past research issues by sex/gender, discipline, and college, at minimum the

following items will be addressed in the proposed climate survey: (1) recruitment/retention; (2) mentoring with colleagues and modeling for students; (3) leadership opportunities such as appointments to supervisory and leadership positions; (4) opportunities/expectations for collaboration within and outside the department; (5) support/expectations for teaching, research, and service; (6) methods of gaining credibility/respectability; (7) expectations for and experiences with achievement of tenure/promotion; (8) personal challenges such as dual-career, childbearing and child care, balancing work/family time; (9) workplace dynamics and institutional culture; (10) intentions to remain at current institution and department; (11) and impact of race, ethnicity, and disability. The climate survey will also seek to identify best practices and lessons learned that can be shared across disciplines within STEM on our campuses as well as across institutions in Tennessee and beyond.

The campus climate survey, distributed through Survey Monkey® or equivalent, will be sent to all faculty (tenured, tenure-track) at MTSU. All faculty will be given an opportunity to respond as we feel understanding the climate for STEM faculty will necessarily include developing an understanding of climate for all faculty at MTSU. As it is important that we have a good, representative sample, we will advertise the coming of the survey and ask the deans and chairs to incentivize faculty to respond. With these strategies, along with two additional follow up reminders, it is our hope that we attain a 50% sample. There are 676 full-time, tenured or tenure-track faculty as of Fall 2012. The final number will depend on faculty present for the AY 2014-2015. Besides the obvious purpose of identifying climate issues as noted above, the survey will allow identification of women willing to be interviewed further about personal experiences or concerns as STEM faculty.

Analysis of the data will facilitate the identification of themes concerning “best practices and lessons learned” and problematic areas as related to salaries, start-up packages, tenure, mentoring, promotion, lab space, retention and reasons one might leave MTSU, recruitment, dual careers, child care and other issues of concern and how these issues vary by gender. The information will be used to construct models of change such as what is problematic for whom and how, how common are these problems across disciplines, and what can be accomplished realistically in terms of change for the betterment of women faculty in STEM.

Campus Focus Groups. In order to fully discover barriers to the advancement of women in academic STEM careers and possible solutions, we intend to conduct focus groups among women STEM faculty. The number of groups (likely not more than four with 10-15 participants) will be dependent upon what areas of concern are identified from the survey. The goal of each focus group is to establish continuing support for the project, create a nuanced understanding of issues not fully addressed on the climate survey, add personal narratives that speak to the climate, help us identify existing “best practices” as related to tenure, promotion, mentoring, etc., and begin discussions of what is desired and possible for institutional transformation and improvement.

Qualitative Interviews. The team assumes that there will be women faculty willing to discuss their concerns about women in STEM and that we will gather more “telling” information if we have confidential one-on-one interviews. Therefore our plan is to conduct in depth, face-to-face interviews (phone interviews, if necessary) for selected women from departments that demonstrate the need for fuller information and analysis. These will be identified as we analyze survey and institutional data. Our data collection may include interviews with willing individuals who have recently (within the last five years) left the university. Interviews with these individuals will provide further insights about the climate on campus that may have precipitated their departure. Questions for the interview will be an expansion of the survey questions, adding narrative depth to the objective responses. To some extent these interviews are dependent upon willingness to be interviewed and the diversity of these participants, but we have a goal of

five interviews at minimum and not more than 25 that cover the variety of women's involvement with STEM activities on campus. These interviews are to expand an understanding of specific cases related to recruitment, retention, advancement and collaboration of women in STEM and to pose transformational and improvement possibilities.

As is the case within qualitative projects, once the interviews cease to include "new" information, we will consider the issue saturated. Analysis of the data will draw on a modification of Strauss and Corbin's grounded theory approach [28], which is an inductive strategy that systematically identifies broad to specific themes that represent the data. We will begin with open coding of the interview narratives and turn then to theme identification of patterns that impede or support the advancement of women faculty in STEM at MTSU. Ultimately this analysis will lead us to identify additional and specific policy recommendations for change.

Policy Review. We will collect and review MTSU and TBR policies and procedures related to recruitment, retention and promotion of faculty. Additional policies may be identified for review based on the results of the climate survey, the interviews, and the focus groups. The policy review will be driven by factors identified in the analysis of data. The purpose of the policy review is to provide specific guidance for institutional transformation initiatives.

To summarize, our study of existing institutional data concerning hiring, promotion, and leadership coupled with additional data, our climate survey, focus groups and interviews will create a mosaic of the status of women STEM faculty at MTSU. This mosaic will lead us to craft a path for necessary and effective institutional change.

Institutional Buy-In: The University Provost is the PI on this project and will ensure the project has the resources required to succeed. Additionally, several activities will be used to build institutional buy-in for this project.

- MTSU ADVANCE Project Kick-Off: The PLT and the WISTEM Center (www.mtsu.edu/wistem) will arrange for the kick-off of the project in early fall 2014. The purpose of the project will be shared with campus stakeholders and all will be asked to participate in the climate survey, forums and interviews. Dean Fischer and Dean Byrnes have agreed to promote the ADVANCE website, activities, and calendar with a "token" (pen, stress ball, lanyard) imprinted with the website address.
- MTSU ADVANCE website: Iriarte-Gross will organize and update the MTSU ADVANCE page on the WISTEM website. A calendar of activities will be posted and updated regularly. All members of the PLT will provide content and input for the website. The PI provides a web designer for the WISTEM Center's, and thus the new MTSU ADVANCE project's website.
- MTSU ADVANCE Social Media: Iriarte-Gross, Ding, and the WISTEM Center will start a Facebook page for the MTSU ADVANCE project. This page will promote the activities of the project to the campus and to the ADVANCE community. Twitter and Instagram accounts will be used also to communicate news about the forums, faculty meetings and professional development presentations with our stakeholders.
- Forums: Iriarte-Gross and WISTEM Center will organize forums with the leadership groups, STEM departments, and other campus stakeholders. These forums will keep the campus informed and involved with the project's data collection and results as well as provide professional development opportunities with invited speakers. Each forum's agenda will

also include some time for discussion of the issues and input from the audience. The PLT and Internal Advisory Board (IAB) will propose topics and serve as facilitators for the forums. External Advisory Board (EAB) members will be invited to speak at select forums and to suggest other invited speakers.

- **Campus Leadership Retreats:** The PLT will introduce, invite participation in the project, and provide project updates at retreats for campus administrators (VPs, deans, directors and chairs) as well at the 2014 and 2015 Fall Faculty meetings.
- **STEM Faculty Meetings:** Each STEM chair has agreed to provide the PLT with a faculty meeting time slot each academic year to inform and request feedback from the faculty. Our respective deans have agreed to encourage participation and to provide time at their chairs meeting to share project updates and to gather feedback.
- **Internal Advisory Board:** We will establish an Internal Advisory Board (IAB) which will consist of junior and senior, male and female faculty, chairs and administrators in the STEM disciplines at MTSU. We have asked STEM department chairs to appoint one of their faculty to the IAB. We will also invite representatives from our Institutional Effectiveness, Planning and Research, Institutional Equity and Compliance, and other appropriate departments to serve as members of the ADVANCE IAB. A list serve for the IAB will be established to facilitate updates as well as to arrange for regular meetings.
- **External Advisory Board:** The PLT have identified national experts on the advancement of women STEM faculty who are familiar with the ADVANCE program. EAB members who have agreed to serve are listed in Table 3. The EAB members will be invited to campus to discuss relevant topics such as work-life satisfaction, mentoring, women STEM faculty of color and implicit bias. EAB members will also be asked to provide advice to the PLT on the various data collection and data analysis activities. Semi-annual (or more as needed) meetings with the EAB will be held via electronic communication (conference call or SKYPE).

Table 3: External Advisory Board Members

Name	Affiliation
Dr. Michael Allen	MTSU Dean of the Graduate College and Vice Provost for Research
Dr. Donna Dean	Past president, Association for Women In Science (AWIS)
Dr. S. Keith Hargrove	Dean, College of Engineering, Tennessee State University PI TSU's NSF ADVANCE Catalyst Project
Betty Dandridge-Johnson	Associate Executive Director for Academic Affairs, Tennessee Higher Education Commission
Dr. Pamela Knox	Associate Vice Chancellor, Academic Affairs, Tennessee Board of Regents
Dr. Suzanne Lenhart	Associate Director for Education and Outreach, National Institute for Mathematical and Biological Synthesis, University of Tennessee, Knoxville
Dr. Ellen Mappen	Senior Scholar, National Center for Science & Civic Engagement

- **MTSU ADVANCE Conference:** At the conclusion of the project, MTSU will host a day-long ADVANCE conference to showcase our self-assessment project. We will invite the campus to participate in a day-long conference to learn how we collected, analyzed and synthesized the data. We will discuss findings and propose strategies that support the recruitment, retention and promotion of women STEM faculty at MTSU. Invited speakers will talk about and lead discussions on career issues such as work-life satisfaction, mentoring, or the

tenure and promotion process. A brochure will be prepared to summarize our findings and proposed strategies for institutional transformation at MTSU.

V. Project Management

The MTSU ADVANCE project will be led by the Project Leadership Team (PLT) composed of University Provost Bartel (PI) and co-PIs Iriarte-Gross, Eller, Ding and Petersen. The PLT will carry out the project's activities as outlined below and in the Timeline (Table 4).

PI: Dr. Brad Bartel, University Provost. Provost Bartel will encourage the participation of MTSU STEM faculty and administrators in the project's activities. He will provide travel support for the ADVANCE team to attend STEM and gender-related conferences and workshops relevant to the project's goals. He will also provide a kick-off reception to introduce the project to the campus community.

Co-PI: Dr. Judith Iriarte-Gross, Professor of Chemistry and Director, MTSU Women In STEM (WISTEM) Center. Dr. Iriarte-Gross will manage the overall project through the WISTEM Center. She will work with the PLT on the implementation of the project's activities. She will communicate with and arrange monthly meetings for the PLT and IAB. She will work with the PLT, IAB and EAB to arrange professional development workshops, invited speakers, and open forums for this project. Dr. Iriarte-Gross will draw on her network of STEM professionals throughout Tennessee and the U. S.

Co-PI: Dr. Jackie Eller, Professor of Sociology and Department Chair, Sociology and Anthropology. Dr. Eller will work with the PLT to synthesize institutional data, develop the campus survey, and design the focus group and interview data collection process. As a qualitative researcher she will also take the lead in the analysis and write up of said data. Dr. Eller will also draw on her network of Sociology and Anthropology professionals throughout the U.S.

Co-PI: Dr. Wandi Ding, Associate Professor of Mathematical Sciences. Dr. Ding will work with the PLT to collect, analyze and synthesize institutional data; identify areas of concern and propose positive strategies for change; create, administer, review and analyze faculty climate survey. Dr. Ding will also assist with the social media activities of this project.

Co-PI: Dr. Karen Petersen, Associate Professor of Political Science and Assistant Dean in the College of Liberal Arts. Dr. Petersen will participate in the development of analytical instruments and the analysis and interpretation of data. Dr. Petersen employs quantitative analysis in her research and is a trained statistician. Additionally, she has access to a network of Political Scientists with expertise in gender issues in the discipline.

Evaluator: Dr. Michael B. Hein, Professor of Psychology and Director of COHRE. COHRE is a University Consulting Center for the I/O Psychology program. Dr. Hein has extensive training and experience in research methodology and data analysis. Dr. Hein will keep the focus of the evaluation on the self-assessment process. He will guide the PLT through the various self-assessment activities and in turn, he will measure the success of the activities and the progress toward the goals of the project. He will also keep the focus of the PLT, IAB and EAB on identifying what institutional transformation might be necessary after data collection and analyses are complete.

Table 4: Project Timeline: (Individuals/groups responsible for each activity are italicized)

Dates	Self-Assessment Activities	Evaluation Activities
<p>Summer 2014 7/1/2014-8/31/2014</p>	<ul style="list-style-type: none"> • Identify and finalize members of project's Internal (IAB) and External (EAB) Advisory Boards (<i>PLT</i>) • Communicate with IAB, EAB and Evaluator on first steps including layout of project website and design of climate survey (<i>PLT</i>) • Construct climate survey (<i>Eller, Petersen</i>) • Interview and hire graduate student (<i>PLT</i>) • Update IRB approval with climate survey instrument (<i>Eller, Petersen</i>) • Design project website, Facebook and other social media for project (<i>Iriarte-Gross, Ding</i>) • Develop timeline and arrange meetings for discussions of project with Leadership Groups and STEM Departments across campus (<i>PLT and IAB</i>) • Develop talking points for presentations (<i>PLT</i>) • Launch MTSU ADVANCE project to campus (<i>PLT</i>) at fall faculty meeting 	<ul style="list-style-type: none"> • Discuss self-assessment activities including feedback on climate survey, with <i>PLT, IAB, and EAB</i> • Evaluator provides initial assessment of survey instrument • Publication of calendar of <i>PLT, IAB and EAB</i> meetings • Begin monthly progress reports
<p>Fall 2014 9/1/2014-12/31/2014</p>	<ul style="list-style-type: none"> • Publish project's website (<i>Iriarte-Gross, Ding</i>) • Meet with MTSU Leadership Groups and STEM Departments to discuss project and encourage faculty involvement (<i>PLT and IAB</i>) • Continue to promote institutional buy-in (<i>PLT, IAB</i>) • Open and promote participation in campus climate survey 9/15-11/1 (<i>PLT and IAB</i>) • Conduct analysis of survey (<i>PLT</i>) • Identify topics from survey for focus groups (<i>Eller, Petersen</i>) • Consult with EAB (<i>PLT and IAB</i>) • Update talking points, website and social media instruments (<i>PLT, IAB and EAB</i>) 	<ul style="list-style-type: none"> • Evaluator provides feedback concerning project's progress • Appraise response rates and send reminders • Participation at <i>PLT, IAB and EAB</i> in-person and virtual meetings • Questions or comments posted on website and social media • Continue monthly progress reports
<p>Spring 2015 1/1/2015-5/31/2015</p>	<ul style="list-style-type: none"> • Identify topics for focus groups (<i>Eller, Petersen</i>) • Schedule and conduct focus groups (<i>Eller, Petersen</i>) • Identify candidates for in-depth interviews and identify interviewees who have left <i>MTSU</i> (<i>PLT, IAB</i>) • Conduct interviews (<i>Eller, Petersen</i>) • Continue with data analysis (<i>PLT</i>) • Meet with <i>Leadership Groups and STEM Departments</i> to update on project (<i>PLT, IAB</i>) • Host open forums for campus to disseminate updates (<i>PLT, IAB</i>) • Update talking points, website and social media instruments (<i>PLT, IAB, EAB</i>) • Consult with EAB on self-assessment 	<ul style="list-style-type: none"> • Contact EAB for interview and focus group feedback • Evaluator provides feedback concerning project's progress • Participation at <i>PLT, IAB and EAB</i> in-person and virtual meetings • Participation in focus group and interviews • Questions or comments posted on project's website and social media • Numbers attending professional development • Continue monthly progress reports

Dates	Self-Assessment Activities	Evaluation Activities
	activities (<i>PLT, IAB</i>) <ul style="list-style-type: none"> • Host a professional development activity on an ADVANCE topic (<i>PLT, IAB</i>) • Attend ADVANCE annual meeting (<i>PLT</i>) • Identify related policies and procedures (<i>Iriarte-Gross, Ding</i>) • Continue to promote institutional buy-in (<i>PLT, IAB</i>) 	
Summer 2015 6/1/2015-8/31/2015	<ul style="list-style-type: none"> • Complete data analysis and start compiling results (<i>Eller, Petersen</i>) • Identify policies and strategies for change (<i>PLT, IAB</i>) • Prepare presentations for dissemination at professional meetings (<i>PLT, IAB</i>) • Update talking points, website and social media instruments (<i>PLT, IAB, EAB</i>) • Consult with EAB on results from self-assessment activities (<i>PLT, IAB</i>) • Identify topics for professional development activities (<i>PLT, IAB</i>) • Identify related policies and procedures (<i>Iriarte-Gross, Ding</i>) • Start planning MTSU ADVANCE Conference for Spring 2016 • Continue to promote institutional buy-in (<i>PLT, IAB</i>) 	<ul style="list-style-type: none"> • Review of policy implications with IAB and EAB • Assessment of data and results collected to date • Evaluator provides feedback concerning project's progress • Participation at PLT, IAB and EAB in-person and virtual meetings • Questions or comments posted on website and social media • Continue monthly progress reports
Fall 2015 9/1/2015-12/31/2015	<ul style="list-style-type: none"> • Host a professional development activity on an ADVANCE topic (<i>PLT, IAB</i>) • Prepare presentations for dissemination of results at professional meetings (<i>PLT, IAB</i>) • Update talking points and website (<i>PLT, IAB, EAB</i>) • Consult with EAB on final stages of project and final report (<i>PLT, IAB</i>) • Present panel on findings at Women In Higher Education in Tennessee annual meeting (<i>PLT</i>) • Meet with <i>Leadership Groups and STEM Departments</i> to update on project (<i>PLT, IAB</i>) • Host open forums for campus to disseminate updates and results of the project (<i>PLT, IAB</i>) • Continue planning MTSU ADVANCE Conference for Spring 2016 (<i>PLT, IAB, EAB</i>) • Incorporate talking points, website content and results for project's brochure (<i>PLT, IAB, EAB</i>) • Continue to promote institutional buy-in (<i>PLT, IAB</i>) • Start white paper listing project's findings and recommendations for IT (<i>PLT, IAB, EAB</i>) 	<ul style="list-style-type: none"> • Evaluator provides feedback concerning project's progress • Number of off-campus presentations planned • Numbers attending professional development event • Participation at PLT, IAB and EAB in-person and virtual meetings • Questions or comments posted on website and social media • Continue monthly progress reports
Spring 2016 1/1/2016-6/30/2016	<ul style="list-style-type: none"> • Complete project's brochure (<i>PLT</i>) • Finish open forums to disseminate results of the project (<i>PLT and IAB</i>) 	<ul style="list-style-type: none"> • Evaluator provides final report on project • Participation at PLT, IAB and

Dates	Self-Assessment Activities	Evaluation Activities
	<ul style="list-style-type: none"> • Finalize and present white paper on project's findings and recommendations (<i>PLT, IAB, EAB</i>) • Host MTSU ADVANCE Conference for all stakeholders to present findings and to plan next steps (<i>PLT, IAB, EAB</i>) • Prepare and finalize final report to NSF (<i>PLT, IAB, EAB</i>) 	<ul style="list-style-type: none"> • EAB in-person and virtual meetings • Number of off-campus presentations planned • Numbers attending MTSU ADVANCE Conference • Questions or comments posted on website and social media

VI. Project Evaluation

The project will be evaluated with formative and summative evaluations as described below.

Descriptive Information: Descriptive information on each of the relevant activities will be tracked and reported. These include number of participants recruited, number of participants and demographic information on participants (e.g. rank, discipline, gender). Participant demographics will be compared to institutional demographics to determine the how well the sample represents the population of interest.

Formative Evaluations: The climate survey will be assessed for internal consistency reliability by dimension. Reactions level evaluations will be developed separately for focus groups, qualitative interviews and forums to assess the degree to which each of these three activities is accomplishing its goals. Open-ended comments will also be collected and analyzed for content. Pre and post evaluation forms will be developed to assess reactions and learning for professional development activities for the leadership team. This information will be compiled and provided to the leadership team after each activity as formative evaluations. Quarterly evaluation reports will summarize the extent to which the project is meeting its goals and the overall adequacy of the measures used. Recommendations for improvement of procedures and measures will be included in these reports.

Summative Evaluation: A final report evaluating the extent to which the project has accomplished its goals and the adequacy of the procedures and measures used throughout the study will be prepared at the end of the project.

VII. Institutional Need for Resources

A self-assessment study to review the status of women faculty in academic STEM disciplines is vital to identify barriers that affect recruitment, retention, participation, and promotion of women STEM faculty at MTSU. Data from this study will provide the opportunity for MTSU to accomplish institutional transformation at the largest public institution in the state of Tennessee.

Tennessee has been historically under-resourced. Tennessee became eligible as an NSF EPSCoR state early in 2002 and received the award in November 2003. Tennessee became eligible automatically for Department of Energy and Department of Defense EPSCoR programs. In April, 2006, Tennessee was "graduated" from EPSCoR. Under policies of the program, Tennessee retained connection to the NSF program for three years, until April 2009. Tennessee, once again, met the NSF criteria to be an EPSCoR state in September 2007. DOE, DOD and NASA currently include Tennessee to their eligibility lists. From 2009 Middle Tennessee State University has been classified as Doctoral Research University, but historically MTSU was a Masters Large University.

Results from prior NSF support

Judith Iriarte-Gross has been a PI or Co-PI on five NSF awards of which two have been awarded during the past five years. These are: **Group Learning in an Interdisciplinary Physical Sciences Course for Non-Majors** NSF #0736940 (Iriarte-Gross and Weller); \$125,400 (2008-2010) Over 2,000 students in non-majors courses were impacted by this work. **GSE/DIS: A Dissemination Project To Increase Girls Raised in Tennessee Science (GRITS)** NSF #0631773, (PI: Iriarte-Gross); \$200,000 (2007-2009). This project supported the growth of Expanding Your Horizons Conference across Tennessee. The conference introduced 1,500 middle and high school girls to STEM careers and provided support the involvement of educators and parents. Brad Bartel, project PI, has been both a president and provost at universities receiving NSF awards, but has not been a PI or Co-PI on an NSF award in the past 5 years.