AC 2012-3578: FINDING WHAT WOMEN WANT: DEVELOPING STRATEGIES TO INCREASE RECRUITMENT AND RETENTION OF WOMEN

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Finding what women want: Developing strategies to increase recruitment and retention in along with attracting external and internal sources of funding

Project Rationale

Numerous reports have discussed the dearth of women in Science, Technology, Engineering; Mathematics (STEM) fields [1, 2]. Almost two-thirds of young children of age group 9-15 state that they enjoy science, but girls' attitudes and interests change by middle school[3]. During high school, girls and boys take the same number of science courses. In addition, girls perform as well as boys in those courses. Despite comparable performance levels, girls rarely continue studying science at college level[4]. Lack of female progress in STEM education has been observed in STEM fields despite multiple measures taken by universities, colleges, schools, industries, and other organizations dedicated to increasing awareness, providing mentoring services, and recruiting and sustaining women in STEM careers[4].

It is puzzling for scholars who study demographics of STEM field, universities and industries to see the slow changing numbers of women in STEM career[5.] The *pipeline* explanation suggests the lack of females in STEM fields is caused by an insufficient number of females who enter the field of graduate studies[6]. By extension, the leaky pipeline; contributes to too many women leaving the field after entering because the experience they have is "uninviting, unaccommodating, and unappealing" [2]. The chilly classroom climate theory[4] , a dearth of role models[7], bias, hostility, age, and the subtle among the gender are all potential factors that accumulate and make it more difficult for women to succeed in demanding fields [8, 9].

Poor preparation and lack of encouragement[10] in STEM subjects in graduate school also contributes to lack of women in STEM fields. This paper aims to study the factors mentioned above and utilize the findings in providing support and guidance to women, at a particular graduate school located at a large, Midwestern, Land Grant University. We hope our findings will help guide women in graduate school to continue their education in the field of STEM and result in the increase retention of women. Broader impact of this project is to recruit and support more women in STEM discipline in graduate school and increase diversity at the University campus along with attracting funding from external resources for sustainability.

Need

One of the graduate school strategic plans at XXX university for 2010-2015 is to recruit and retain students from diverse populations ("The Graduate School Strategic Plan", 2010) (For this strategic plan to be successful, it is important to have more females enrolling in the STEM discipline at the graduate level while simultaneously sustaining the participation levels of women currently engaged in graduate education.

This University remains a preeminent institution for STEM education. To maintain University's excellence in the 21st century, it is important to recruit and retain female graduate students who may excel in their discipline. There is a need to attract the best, brightest and most creative female students for graduate studies. At this University, numerous efforts exist through Women

in Engineering, Women in Technology and Women in Science programs for recruitment and retention of women. Still the numbers of graduate women studying in STEM fields remain low.

The NSF ADVANCE program designed for increasing participation and advancement of women in academic science and engineering career which provides funding to address the scarcity problem of graduate women in STEM fields [3]. This proposal has potential to secure long-term funding from internal and external sources for sustainability.

Project Description and Objectives

This proposal will be broken into three parts. The study will be designed based upon social constructionist theories using communicative prospective [11], which will reveal how female students create, negotiate and shift their identities while selecting, studying and practicing in STEM field. Research questions include: a) what do they think about graduate education; b) what does pursuing career in STEM field mean to female?; c) what messages are enunciate about STEM discipline, and how does these messages differ at different points in a female's life?; d) what were the initial factor(s) compelling females to choose STEM as field of study?; e) what features of STEM discipline seems enticing or dispiriting to females from pursuing education and practice in these area?; f) what kind of guidance, mentoring, and other support services have females received to make the decision to study in the STEM discipline? All necessary procedure for investigation/survey of human subject will be followed throughout the study. Before starting assessment and evaluation studies approval from internal Human Subject Review Boards at XXX University will be obtained. All necessary written consents will be obtained. Confidentiality throughout the study will be maintained.

Study will be conducted in three phases- phase I will be pilot survey for further study. Phase II will be interviewing participant from the phase I and conducting workshops and field trip. Phase III will be post-survey and using the finding from study to recruit more graduate students in STEM discipline. Also write proposal for NSF-ADVANCE grant for continuing further studies.

Phase I of the project will be to conduct survey (quantitative and qualitative) among female undergraduates, graduates and faculty in STEM discipline. This will be accomplished by emailing surveys to a stratified random sample of female students and faculties. Survey results will be evaluated to identify the factors impacting female students' decisions while choosing and continuing studies and practices in the STEM discipline.

Phase II of the project using results from surveys, respondents will be requested for in-depth interview, in these interview participants will be analyzed about existing perceptions and attitudes regarding the current culture and climate at XXX University and what methods might best mitigate the barriers. Analysis of interview data will help identify the challenges women currently face and provide mentoring services to rationalize the identified barriers. This will include organizing various workshops, by inviting professors and industry personnel to have dialogue and share their experiences in academia and industry. Various field trips will be organized to provide age-appropriate exposure to female in undergraduate and graduate in STEM discipline. Also females will be made aware about various women organizations on XXX University which will help female to receive mentoring service from peers and be active participant of these organizations.

Phase III of the study will be to re-survey the females who were participant of phase I and II. This result will show if there was any benefit of all these workshops, field trips and being involved in women organization help their decision in graduate education. This empirical research will provide opportunities using all the above study findings to enhance the recruitment, retention and success of women at XXX University in STEM discipline.

Method Evaluation

For analyzing empirical data collected using surveys and interviews, qualitative and quantitative methodologies will be used. Qualitative data from individual interviews, themes will be uncovered using grounded theory and to reveal important discursive movement using positioning theory[11] .

Quantitative data will be collected using Likert scale for ranking responses of surveys.   Statistical calculations and hypothesis tests will be done using SPSS® and LISREL® program. Relationships between variables are examined using social networking and structural equation modeling analysis tools. Finally, participants in the field trips and workshops will be asked to complete an evaluation form providing feedback about the activities.

Expected Findings

1) Undergraduate women will be able to gain in depth knowledge about STEM field and might even consider continuing education in STEM field.
2) Women in STEM field will be able to engage themselves more with their peers, gain mentoring from industry experts.
3) The use of role models and exposure to successful women in the field will provide them guidance about what they can do advance their career continuing in field of Technology and networking opportunity.
4) Objective of the project is to increase recruitment and retention of women in STEM for undergraduate and graduate studies.
5) The long-term goal of this project is to provide beneficial strategic recommendations for academic institutions and industry that will enhance the recruitment and retention of women in Technology and help them excel in their careers.

Reference

1] Fogg, P. (2003, April 18). The gap that won't go away. *Chronicle of Higher Education,* 49(32). Retrieved
       October 5, 2010 from http://chronicle.com/free/v49/i32/32a01201.html.
2]Trower, C. A. & Chait, R. P. (2002, March/April). Faculty diversity: Too little for too long.
       Harvard Magazine, 104(4), 33–37. Retrieved October 5, 2010 from: http://www.harvard
       magazine.com/oline/030218.html.
3] NSF advance. (2009). Retrieved from http://www.nsf.gov/pubs/2009/nsf0941/nsf0941.pdf on September 15,
       2010.
4] Hall, R. M., & Sandler, B. R. (1982). The Classroom Climate: A Chilly One for Women?

5] Hill, C., Corbett, C., & St Rose, A. (2010). Why So Few? Women in Science, Technology, Engineering, and Mathematics. Washington, D.C.: Association of American Colleges.

6] Blickenstaff, J. C. (2005). Women and science careers: leaky pipeline or gender filter? *Gender and Education, 17*, 369-386.

7] Wasburn, M. and Miller, S. (2007/2008). Keeping women students in technology: preliminary evaluation of an intervention. Journal of College Student Retention, 9(2): 205-219.

8] Hagedorn, L. (1999/2000). Factors related to the retention of female graduate students over 30. Journal of College Student Retention, (1)2: 99-114.

9] Valian, V. (1999). *Why so slow?: The advancement of women*: The MIT Press. Cambirdge, MA.

10] Seymour, E., & Hewitt, N. M. (2000). *Talking about leaving: Why undergraduates leave the sciences*. Westview Press.

11] Cohen, L., Manion, L., & Morrison, K. R. B. (2007). Research methods in education. Routledge: New York, NY.