Mid-Career Virtual Mentoring for Advancement of Women STEM Faculty

Abstract

The mixed method examination of a pilot of a virtual peer mentoring program for the advancement of women faculty is described. Evidence from the semi-structured interviews and surveys demonstrated that the peer mentoring experience had a direct impact on the mentor and mentees' efficacy related to their career progress, promotion, and mentoring competencies. Sense of belonging in the STEM community also improved. The study results will be presented and discussed as well as the development of the program.

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Poor Representation

Women in traditionally male-dominated settings also often remain out of the information loop in terms of advice and professional development opportunities [1,2]. Moreover, a recent American Association of University Professor [3] faculty report demonstrated that while women represent about half the population of instructors and assistant professors, their representation significantly decreases in senor level faculty and leadership positions. This research was consistent with a university climate survey at a BIPOC Serving Intuition in the South. In the recent 2019 climate survey, STEM women faculty reported men are more likely than women to receive helpful career advice from colleagues. STEM women also agreed that white faculty were more likely than faculty of color to receive helpful career advice from colleagues. Black women faculty felt that men receive preferential treatment in the areas of recruitment and promotion. Tenured associate professor level STEM women reported they had less understanding of the criteria and less confidence in the process for promotion to full professor compared to other ranks. STEM women further reported they received mixed messages from colleagues regarding the requirements for promotion. Moreover, women represented less than a third of employees in STEM administration and high-ranking faculty positions (e.g., associate, full).

Mentoring

Lack of representation of White and BIPOC women in STEM academic careers has been attributed to myriad reasons, including family responsibilities, lack of fit between jobs and personal values, and a reportedly hostile climate [4-9]. However, research supports that a so-called "confidence gap", resulting from poor self-efficacy, serves as a foundational reason for the disparity in participation in STEM academic careers, especially senior level positions. For over two decades, researchers have attributed White and BIPOC women's lack of engagement and matriculation from STEM degrees or senior level positions in STEM careers [10-15] to poor self-efficacy.

Consequently, growing interest in improving self-efficacy of women to broaden participation in senior level STEM positions have emerged, and engagement in mentoring relationships have been identified as central to the development of self-efficacy and, ultimately, persistence and advancement [10-15]. Participation in mentoring relationships has been cited as an important element in assisting BIPOC women in advancing in White, male dominated fields [7-8] environments; however, the majority of these studies have been conducted with junior level faculty in traditional, face-to-face at Primarily White Institutions (PWIs).

Purpose

Therefore, the purpose of this mixed method study was to examine how and to what extent women mentees' and mentors' participation in a pilot of a virtual peer mentoring experience at an institution that serves primarily minorities influenced their STEM self-efficacy related to mentoring competencies, career progress, and promotion, as well as a sense of belonging in the STEM community. For the purpose of this study, mentorship was defined as "a reciprocal, dynamic relationship between mentor (or mentoring team) and mentee that promotes satisfaction and development of both" [16], and peer mentoring was defined as a reciprocal, dynamic relationship that occurs between or among peers, in which one peer is more skilled or experienced than the other. The focus on peer mentoring is especially important as peer mentoring includes both psychosocial (e.g., emotional and psychological support) and task functions (e.g., providing information, setting goals, finding resources for career advancement).

Theoretical Framework

Social Cultural Career Theory (SCCT; 19) provided the framework for this study. The premise of SCCT is that faculty interest promote their intention to pursue STEM career advancement. Interest and intention motivate action, with success and failures providing specific feedback that influences self-efficacy and performance outcome. Further, self-efficacy and beliefs surrounding the likelihood to achieve a performance outcome influence motivation, goals, and persistence. SCCT is grounded in Bandura's self-efficacy framework, which proposed four factors that influence self-efficacy: mastery experience or performance accomplishment, vicarious experience, social persuasion, and psychological response. These four factors intersect to form an individual's self-efficacy-- individual's perceptions of being capable of reaching success on certain tasks towards goal completion and influencing STEM [19,20]. Self-efficacy has been shown especially salient to ethnic and racial minorities and women [13, 19,20].

Methods and Design

A virtual STEM women faculty peer mentoring experience for mid-level career women faculty was established and examined using a mixed method approach. STEM senior level faculty and administrators served as mentors to mid-level career faculty mentees. As researchers have purported those mentors and mentees need to be socialized to the mentoring process and develop mentorship competencies (e.g., relational, disciplinary, and cultural responsiveness) to maximize the benefits of the experience [7,8], both mentors and mentees completed a virtual mentorship training, hosted via a learning management system, before engaging in the mentoring relationship. The training consisted of a four-week online training with collaborative discussions and problem-based scenarios to socialize both the mentors and mentees to the peer mentoring process. After completing the training, the mentors and mentees were assigned to peer-mentoring dyads and collective groups, meeting bimonthly via a video conferencing system for two semesters. They also attended six virtual and blended luncheons with STEM speakers and engaged in round table discussions. Mentors and mentees completed pre and post surveys, largely on a review of the mentoring literature and validated mentoring competency and self-efficacy instrument [in press]. Survey items were measured on a five-point Likert type scale (1 = Strongly Agree and 5 = Strongly Disagree) (efficacy related to career and belonging) and a twelve -point Likert type scale (0 = Can not do and 11 = Certainly Can do) (mentoring competencies), where respondents rated their level of agreement with each item. For each subscale, the mean and standard deviation were computed. Follow up semi-structured interviews were conducted and analyzed using Yin's case study guidelines [17,18].

Three mentors (100%, N =3) and five mentees (100%, N = 5) completed the survey. Mentors were tenured (66.67%) or tenure-track (33.33%) senior-level professors (e.g., full). One mentor was a dean. A majority of the mentors were non-Hispanic White, U.S. citizens (66.67%, n = 2). Mentors came from the College of Arts and Sciences (66.67%, n = 2) and College of Engineering (33.33%, n = 1). Responding mentees were also non-Hispanic U.S. citizens who were tenure-track professors who were getting ready to go up for promotion as associate professors or were associate professors (100%). These mentees came from the College of Engineering (25%, n = 1), the College of Arts & Sciences (50%, n = 3), and the Lowenberg College of Nursing (25%, n = 1).

Results

Both the mentors and mentees agreed to have higher efficacy related to and be satisfied with their career goal progress, professional development opportunities, promotion opportunities, and sense of STEM community after participating in the virtual peer mentoring program. Similarly, mentors and mentees rated their mentoring competencies across all areas as high to moderate prior to participating in the mentoring program. However, after participation in the program, competency ratings on most subscales for both the mentor and mentees improved. See Tables 1 and 2.

Table 1. Mentor Survey Data (N =3)

Scale	***Pre Survey***		***Post Survey***	
Subscale	***M***	***SD***	***M***	***SD***
Career Goal Progress (Q=4)	1.00	0.00	1.25	0.45
Professional Development and Opportunity (Q=5)	1.00	0.00	1.40	0.63
Promotion (Q=4)	1.00	0.00	1.58	0.90
Brief Sense of Community (Q=4)	1.00	0.00	1.83	0.94
Mentoring Competencies				
Facilitate Mentor Meetings (Q=4)	9.08	1.38	10.00	0.00
Align STEM Mentoring	8.17	1.70	10.00	0.00

Relationship Expectations (Q=4)				
Set and Accomplish Goals (Q=4)	7.75	1.22	10.00	0.00
Build and Maintain a Trusting Mentoring Relationship (Q=7)	9.71	1.82	10.00	0.00
Empathetically Challenge my Mentee (Q=6)	7.17	3.15	10.00	0.00
Facilitate my Mentee's Academic and Professional Development (Q=4)	8.33	2.53	10.00	0.00
Support Psychosocial Development (Q=4)	9.42	1.73	10.00	0.00
Use Technology to Facilitate the Mentoring Relationship (Q=4)	8.33	2.15	10.00	0.00

Cultural Responsiveness (Q=8)	9.46	2.34	10.00	0.00
Engage in Ethical Behavior (Q=3)	9.67	2.69	11.00	0.00
Affective Component (Q=5)	6.47	2.90	7.00	3.47

Table 2. Mentee Survey Data (N =5)

Scale	***PreSurvey***		***Post Survey***	
	M	***SD***	***M***	***SD***
Career Goal Progress (Q = 4)	1.71	0.76	1.13	0.35
Professional Development and Opportunity (Q = 5)	2.10	1.37	1.20	0.42
Promotion (Q = 4)	2.50	1.69	2.00	0.00
Brief Sense of Community Scale (BSCS) (Speer, 2008) [modified] (Q = 4)	3.00	2.14	1.25	0.46

Mentoring Competencies				
Facilitate Mentoring Meetings (Q=4)	9.88	1.25	9.75	1.50
Align STEM Mentoring Relationship Expectations (Q=4)	9.63	1.60	10.25	0.96
Set and Accomplish Goals (Q=4)	9.25	1.75	9.75	0.50
Build and Maintain a Trusting Mentoring Relationship (Q=7)	10.57	0.94	10.00	1.00
Accept Challenge (Q=6)	8.92	2.07	9.33	1.21
Engage in Academic and Professional Development (Q=4)	9.75	1.39	10.50	1.00
Engage in Psychosocial	10.13	1.73	10.50	1.00

Development (Q = 4)				
Use Technology to Engage the Mentoring Relationship (Q=4)	11.00	0.00	11.00	0.00
Cultural Responsiveness (Q=8)	10.69	0.79	10.00	1.07
Engage in Ethical Behavior (Q=3)	10.03	0.41	11.00	0.00
Affective Component (Q=5)	5.00	4.27	5.80	4.27

Evidence from the interviews and open-ended survey questions supported the quantitative data and demonstrated that mentoring experience had a direct impact on the mentor and mentees' s efficacy related to their career progress, promotion, and mentoring competencies. Sense of belonging in the STEM community also improved. The thematic analysis of the data sources are revealing that specific elements of the peer mentoring experience influenced the mentor's and mentees, including the following themes: 1) recognition, 2) institutional knowledge, and 3) engaging in a sisterhood. All will be discussed in detail during the presentation. The mentors and mentees also noted that while engaging with other mentors and mentees virtually was challenging at times and they wanted to meet in person, the virtual element of the experience is what made it possible for them to participate given their schedules and responsibilities. They experienced challenges, including scheduling conflicts, and desire for more engagement, and mentors desired more opportunities to meet with mentors.

Significance of the Study

While the benefit of mentoring is well documented, the programs, books, and ideas on mentoring in STEM which have emerged, unfortunately, lack empirical research [7]and are primarily focused on mentoring in face-to-face environments at predominately white institutions [7]. Thus, psychosocial aspects of the relationship have been largely ignored. Further, in general, peer mentoring programs that employ online and blended aspects are only beginning to be developed and piloted, with most focusing on disciplines external to STEM. This study answers the call for the continuing need to develop interventions to support for mid career STEM faculty who women Further, this study adds to the current body of literature on the benefits of the peer mentorship experience to mentors, which are often not the focus of the mentoring literature.

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Scholarly and Practical Significance

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