

Biomedical Research Careers Pipeline in a Southern Hispanic-Serving Institution (HSI): Perspectives of Faculty and Students on Efficacy of Mentoring Workshops

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Abstract

The purpose of the study was to investigate the efficacy of the Mentoring Workshops for students and faculty. College student and faculty participants' perceptions of competencies, abilities, beliefs, and attitudes through the study university's mentoring workshops were reported. The studies were exploratory in nature, leading the investigators to conduct pre-post surveys. Findings suggested that students and faculty had a positive perception of the mentoring workshops' effectiveness. Faculty provided suggestions, such as making the workshops longer, providing case studies, and holding future mentoring workshops, were reported for enhancing the effectiveness of the mentoring workshops.

Keywords: Mentoring workshops; Biomedical research careers; HSI; Faculty perspectives; Student perspectives

1. Introduction

As individuals begin their journey at a university, they face a new educational system demanding a higher level of knowledge and competence, various methods of teaching and grading, and a higher level of independence and responsibility. Undergraduate students may confront numerous social, academic, and psychological challenges as they navigate through their undergraduate years (Landrum & Nelsen, 2002; Lei & Chuang, 2009). They face pressure to succeed, become active on campus, and explore social groups. University faculty has a unique opportunity to serve as personal connection, informational resource and professional role models for undergraduate students. The role of a mentor can be a challenging task though it can be an essential source of guidance and

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support throughout the challenges undergraduate students face (Landrum & Nelsen, 2002; Lei & Chuang, 2009). Often, faculty members are assigned a mentoring role without proper training or guidelines on mentoring skills.

In an effort to strengthen mentorship for stakeholders pertinent to biomedical research careers pipeline, a southern state Hispanic-Serving Institution (HSI) offered two free mentoring workshops for its college faculty and students in Spring 2014. It is important that these workshops were evaluated so the participants' viewpoints could be shared and the efficacy of these workshops could be determined. The purpose of the study was to investigate the efficacy of the mentoring workshops and to report student and faculty participants' perceptions of competencies, abilities, beliefs, and attitudes through the mentoring workshops.

2. Literature Review

Mentoring is a term commonly characterized as a collaborative relationship between a less experienced individual, called a mentee, and a more experienced individual, a mentor. Mentoring is described as a dyadic, face-to-face relationship where the mentor nurtures the mentee's professional, academic, or personal development (Donald, Ensher, & Grant-Vallone, 2000). In a mentorship relationship, the mentor serves as a supportive and guiding example for the mentee. The mentor's implementation of instrumental and psychosocial support is essential for achieving the mentee's goals (Elizov, Boillat, & McLeod, 2014).

2.1 Mentoring Relationship

Mentoring relationship are mutual, involving repeated interactions that take place over time. It is a relationship that is based on trust and respect. A valuable mentor should display characteristics of honesty, openness, and trustworthiness (Fajana & Gbajumo-Sheriff, 2011). Mentor's effective characteristics should include the skills to spot others' potential and to encourage mentees while displaying patience and tolerance (Fajana & Gbajumo-Sheriff, 2011). Mentoring is an interdependent relationship, in which the quality of the interaction and the blending of personality characteristic are more important than the characteristic of either member (Long, Fish, Kuhn, & Sowders, 2010). Developing a trustworthy relationship between the mentor and the mentee takes time. A strong mentoring relationship should be viewed as a partnership, where both the mentor and mentee exchange ideas openly. Each person should be committed to their role and the venture (Long, Fish, Kuhn, & Sowders, 2010).

Once a mutual relationship between the mentor and mentee is established, it must be nourished (Mirza, 2007). During a mentor-mentee relationship, participants exchange information, express their emotions, and agree upon a mutual set of goals. It is beneficial for the mentor and mentee to mutually set goals and expectation at the beginning of the relationship. Both should be selective when deciding upon goals, projects, and demands that will be included within the relationship. Mentees can be most effective by being goal-oriented, seeking challenges and taking initiative. They shouldn't be too self-promoting, too busy or overly dependent (Mirza, 2007).

2.2 Four Linear Stages of Mentoring

A prosperous mentoring relationship progresses through four linear stages: intuition, cultivation,

separation, and redefinition (Kram, 1985). Kram (1983) collected data from 18 developmental relationships as they were occurring and determined the four-phase framework to describe the mentoring process. The four-phases are: initiation, cultivation, separation, and redefinition.

The initiation stage of the mentor-mentee relationship generally lasts about 6-12 months. During the initiation stage, the mentor and mentee become acquainted. The mentor and the mentee clarify expectations and roles. The relationship is set in motion when both the mentor and mentee discover the value of relating to each other. From an undergraduate student's viewpoint, the initial stage would occur during their freshman year. The relationship may be academically focused, often centering on courses to take, minors to choose, study tips, or career paths (Long, Fish, Kuhn, & Sowders, 2010). Freshman students who participate in mentoring programs can benefit heavily from having a personal connection with someone on campus. First year mentoring strengthens undergraduate experience and undergraduate education in a university setting.

After assuming a prosperous initiation stage, the mentor and mentee progress to the cultivation stage. The cultivation stage is the fundamental stage of learning and development. The positive outlook that originated in the initiation phase is tested during the cultivation stage (Kram, 1983). The cultivation stage lasts about two to five years. Throughout the cultivation stage, the mentee and mentor form a positive relationship. The mentor coaches the mentee profitable lessons gained from the mentor's own experience and expertise. From an undergraduate's perspective, the cultivation stage would start during the sophomore year.

The separation phase is characterized by significant changes in the relationship marked by turmoil, anxiety, and feelings of loss (Kram, 1983). The relationship is marked by momentous change in the mentoring relationship. It is generally described as the end of the mentoring relationship. The mentee establishes a sense of independence and autonomy (Kram, 1983). The mentoring relationship shifts and becomes a less central part of each other's lives. From an undergraduate's perspective, the separation phase would start during or after a student's senior year.

The final phase of the mentoring relationship is the redefinition stage. During the redefinition phase, the mentoring relationship expands into a new form or ends. Kram (1983) stated that most mentoring relationship evolved into a type of friendship, while exhibiting less of a hierarchal relationship between the mentor and mentee. Both the mentor and mentee perceive that a shift in developmental task has occurred in the relationship and the mentorship process is no longer essential or desired.

2.3 Career Mentoring

Numerous researchers have reported that mentees received more organizational and career benefits than those without mentors. Donaldson, Ensher, and Grant-Vallone (2000) examined the concurrent and long-term relationships between mentoring, organizational commitment and citizenship behaviors among diverse, non-professional protégés. The results from 157 participants demonstrated that professional protégés in a high-quality mentoring relationship have a higher organizational commitment than protégés in low quality mentoring relationship (Donaldson, Ensher, & Grant-Vallone, 2000). Participants proclaimed greater performance at the workplace than those employees in a moderate or low quality mentoring relationship. In other words,

participants in a high-quality mentoring relationship reported high organizational citizenship behaviors. These behaviors included helping coworkers when their workloads elevated, assisting supervisors, and volunteering their time when not required (Donaldson, Ensher, & Grant-Vallone, 2000).

2.4 Academic Mentoring

Academic mentoring is an effective tool to cultivate better educational outcomes (Gagliardi, Webster, Perrier, Bell, & Straus, 2014). Mentoring programs make a beneficial contribution in the academic environment. It is an adequate approach to help students progress in their academic careers. Several research studies suggest that mentoring programs reported attaining or improving desired knowledge, skills, or performance (Gagliardi, Webster, Perrier, Bell, & Straus, 2014). Evertson and Smithey (2000) examined the efficacy of using a research-based mentoring program to facilitate mentor teachers in supporting their mentees. The study compared mentees who participated in formal mentoring programs to participants mentored by experienced teachers with no formalized mentoring preparation. The participants were 46 experienced teachers who served as mentors to new teachers. The results from the 46 mentor-mentee pairs indicated that protégés had effectively organized and managed instructions at the beginning of the year, while establishing more workable classroom routines (Evertson & Smithey, 2000). Students of protégés with trained mentors showed greater cooperation in academic tasks.

2.5 Benefits and Challenges of Mentoring

Studies have demonstrated the possible benefits students may acquire through a mentoring relationship. The benefits of mentorship included the development of personal and intellectual/skills, an increase in student retention and academic success, and pursuit of graduate studies (e.g., Seymour, 2004; Van Vliet, Klinge, & Hiseler, 2013; Lopatto, 2006; Landrum & Nelsen, 2002).

2.5.1 Personal benefits and intellectual/ skill development

The personal and intellectual benefits that may come from a mentorship relationship can be found in a wide selection of literature. In a study conducted by Seymour (2004) of 76 interviews of students, who had participated in a faculty-mentor URP (undergraduate research program), benefits were reported in areas of personal/professional gain and intellectual/skill development. Students reported an increased in confidence, establishment of collegial relationships with mentors, and with members of their research groups (Seymour, 2004). Students also reported an improvement in critical thinking/problem-solving, increased knowledge and understanding of the research process, gains in communication skills along with other practical skills, and greater clarification and confirmation of career choices (Van Vliet, Klinge, & Hiseler, 2013). Similarly, Lopatto (2006) analyzed survey responses from 73 students, who had also participated in a faculty-mentor URP (undergraduate research program) and found that benefits in personal/professional development were evident, including increased self-confidence, independence, sense of accomplishment, and self-understanding. Furthermore, developing an understanding of the research process, relationship with the faculty mentor, and learning about a topic in depth, were also benefits reported by students (Van Vliet, Klinge, & Hiseler, 2013). The personal and

intellectual benefits of mentorship were also noted by Landrum and Nelsen (2002), who surveyed faculty on their views on how students would benefit in a faculty and undergraduate student mentorship. From the faculty's perspective, students benefitted of interpersonal and technical skills, which included development of a one-to-one relationship with a faculty member, greater clarity about whether to pursue graduate studies, enhanced critical thinking, data collection skills, and academic writing (Landrum & Nelsen, 2002).

2.5.2 Increased student retention and academic success

Another potential benefit of undergraduate mentorship is the increase of student retention and academic success (Van Vliet, Klinge, & Hiseler, 2013). For instance, in a study published by Campbell and Campbell (2007), 339 undergraduate students were paired with a faculty member in a research mentorship. In comparison to the 339 control group participants who received no faculty mentorship, students who were mentored had a significantly higher grade point averages (GPAs), completed more coursework and showed higher rates of retention at the end of the academic year (Campbell & Campbell, 2007).

2.5.3 Pursuit of graduate studies

Pursuing graduate degrees is another potential benefit of an undergraduate mentorship. Several studies have indicated that undergraduates who are mentored by faculty are more likely to pursue into graduate studies (Van Vliet, Klinge, & Hiseler, 2013). In the study conducted by Campbell and Campbell (2007), students who had participated in a research mentorship program were tracked after 11 years. The study reported students were 1.5 times more likely to pursue graduate studies than non-mentored students (Campbell & Campbell, 2007). Faculty mentors may influence the student's decision on pursuing a higher educational degree such as graduate school, and/or the student's decision to attend an institution or program (Lei & Chuang, 2009).

2.6 Challenges

Mentorship may have significant benefits for students, faculty members, and universities, however several challenges may work against these benefits. A major challenge of mentorship is the pressures placed on both the student and faculty (Lei & Chuang, 2009). Developing and maintaining a successful mentoring relationship require time commitment from both faculty and students. In addition to teaching, research, service, administrative responsibilities, and obligations outside of the university (e.g., family), faculty may simply not have enough time to invest in mentoring students (Van Vliet, Klinge, & Hiseler, 2013). Similarly, students also face several pressures/obligations that may stand in their way of being mentored. Lei and Chuang (2009) identified several pressures/obligations students face, including academic obligations (e.g., focusing on coursework), obligations outside of school (e.g., job, family, and friends), and the time commitment required. Another challenge of mentorship is the lack of resources provided by the university. Faculty may lack or receive minimal resources needed to mentor students in research. Inadequate funding for research mentoring, and shortage of research space and equipment may arise complications within the mentorship as well (Lei & Chuang, 2009).

2.7 STEM Professional Skills Enhancement Workshop

The literature casts a wide net of workshops for students and faculty. Although there is evidence supporting the use of effective workshop strategies (e.g., Lu, Ward, Overton, & Shin, 2014), STEM (science, technology, engineering, and mathematics) education research reveals a gap between faculty awareness of evidence-based reforms and faculty practice (Henderson & Dancy, 2008). Hanson and Stultz (2015) hosted a collaboration-focused faculty development workshop that encouraged participants to explore whether and how they might integrate their scientific research interests into undergraduate course-associated labs. The goal of the study was to test the hypothesis that collaboration-focused workshops can guide transition faculty toward implementing the evidence-based STEM education reforms (Hanson & Stultz, 2015). Participants were 30 faculty members, from 15 small colleges or university who had a narrow opportunity to collaborate within their institutions.

Participants were asked to complete an anonymous survey, prior to attending the workshop (Hanson & Stultz, 2015). The survey aimed to identify the participants' comfort with interdisciplinary research and teaching, varying types of collaboration, technology and barriers. The participants also completed a post-workshop survey to assess the impact. The results from the workshop indicated a positive impact on participants. Hanson and Stultz's (2015) workshop emphasized on interdisciplinary and cross-institutional collaboration and demonstrated to be an effective model for moving faculty from vision to action for change.

3. Method

3.1 Study 1: Workshop Effectiveness for Students

3.1.1 Participants

There were 138 college students who participated in the first workshop event held by Department of Biomedicine in the studied university. Their mean age is 21.62 (SD = 4.72). Their average years being at the studied university was 2.64 years (SD = 1.80). Among the participants, 69 % were female students and 31 % were male students. In addition, 93.4% of the participants identified themselves as bilingual or trilingual and only 6.6 % were monolingual with English being their only language. Moreover, 38.7 % of the participants were currently being mentored, whereas 61.3 % were not. In terms of these students' majors, 43.7 % were in the Department of Biomedicine, 31.0 % were in the Department of Biology, 8.5% were in the Department of Nursing, 7.0% were in the Department of Exercise Science, 8.5% were in Department of Psychology, and 1.4% were in other departments. Among the participants, 79.8% received some form of scholarship or financial aid. In terms of their primary or first language spoken, 49.2% reported English, 49.2% reported Spanish, and 1.6% reported others. In terms of race/ ethnicity, 91.7 % of the participants identified themselves as Hispanic or Latino, 4.5 % identified themselves as White, and 2.3 % identified themselves as Black.

3.1.2 Procedures

Participants voluntarily participated in the study and were asked to fill out the Pre-Workshop

Student Survey before the workshop started and the Post-Workshop Student Survey at the end of the workshop. The workshop was held in a large lecture hall by Department of Biomedicine with one guest speaker, Dr. Julio Ramirez from NIH National Research Mentoring Network (NRMN). It lasted one and a half hours in an afternoon in Spring 2014.

3.1.3 Design and Instruments

To investigate the effectiveness of the Mentoring Workshop for students and to explore and understand science-related majors' perceptions of their competencies, abilities, beliefs, and attitude, a pre-post survey design was implemented.

As the study was exploratory in nature, the investigators created the Pre-Workshop Student Survey and the Post-Workshop Student Survey. The Pre-workshop Student Survey contained 10 five-point Likert-scale questions and plus demographics. The questions included attitude, confidence, and perception types of questions. For example, "Do you believe mentoring for undergraduate students is important to their success?" "I would like to be a scientist in the future." and, "Overall, how confident are you in becoming a successful scientist right now?" Participants were told to rate on a scale of 1-5, 1 being 'least, uncomfortable, or strongly disagree', and 5 being 'most, very comfortable, or strongly agree'. The Post-Workshop Student Survey contained 11 five-point Likert-scale questions and one open-ended question. Some additional questions not on the Pre-Workshop Student Survey were to investigate if the workshop was effective and/or useful for students. For example, "Do you think the workshop was helpful?" "Will you attend future related workshops?" and, "Do you think the workshop was organized well?"

Both surveys, when first created, went through: (a) a panel of experts which consisted of faculty with background in biomedicine, educational psychology, measurement, mentoring, and research to ensure content validity = 1.0 (after revision) which showed high agreement rate from the panel of experts; and (b) face validity check with a group of students ($n = 3$) and an obtainment of an estimate of time for filling out the surveys. After data collection, both surveys went through: (a) inter-item consistency calculations to show high internal reliabilities of Cronbach's alpha = 0.79 for the Pre-Workshop Student Survey and Cronbach's alpha = 0.93 for the Post-Workshop Student Survey (The internal reliability for Pre-workshop Student Survey was lower due to the exclusion of invalid raw data); (b) EFA (Exploratory Factor Analysis) to validate the instruments and to help group influential factors; and (c) inter-rater reliability calculations from two independent trained research assistants for answers to open-ended questions to show high agreement rate between their ratings ($r = 1.0$).

3.1.4 Data Analysis Methods

Statistical analyses were used due to the nature of quantitative data collected. In addition to aforementioned analyses for reliability and validity, participants' demographic information was collected and their changes in responses were analyzed through EDA (Exploratory Data Analysis), paired t-tests, ES (effect size) calculation, and correlational analysis using SPSS 19.0.

3.2 Study 2: Workshop Effectiveness for Faculty

3.2.1 Participants

The participants consisted of 30 faculty members who participated in the Faculty Mentoring Workshop event held by Department of Biomedicine in the study university. One case with lots of missing data was excluded in all the analyses. The faculty participants' mean age is 38.94 (SD = 12.28), with the minimum age of 20 and the maximum age of 61. Their average years being at the studied university was 6.95 years (SD = 4.96). Among the participants, 48 % were female faculty and 52 % were male faculty. In addition, 89.3 % of the faculty participants identified themselves as bilingual or trilingual and only 10.7 % were monolingual with English being their only language. Moreover, 85.2 % of the faculty participants were currently mentoring students, whereas 14.8 % were not. In terms of their working departments, 72.2 % were from the Department of Biomedicine, 11.1 % were from College of Education, and 16.8 % were from other departments/colleges. In terms of their first language spoken, 40.7 % reported English, 37.0 % reported Spanish, and 22.2% reported others. In terms of race/ ethnicity, 34.8 % of the participants identified themselves as Hispanic or Latino, 34.8 % identified themselves as White, and 30.4 % identified themselves as Asian.

3.2.2 Procedures

Faculty participants voluntarily participated in the study. They were asked to fill out the Pre-Workshop Faculty Survey before the training workshop started and the Post-Workshop Faculty Survey at the end of the workshop. The workshop was held in a large lecture hall by Department of Biomedicine with one guest speaker, Dr. Julio Ramirez from NIH National Research Mentoring Network (NRMN) and lasted two hours in an afternoon in Spring 2014.

3.2.3 Design and Instruments

To investigate the effectiveness of the Mentoring Workshop for faculty and to explore and understand faculty's perceptions of their abilities, beliefs, and attitude, a pre-post survey design was implemented.

As the study was exploratory in nature, the investigators created the Pre-Workshop Faculty Survey and the Post-Workshop Faculty Survey. The Pre-Workshop Faculty Survey contained 8 five-point Likert-scale questions and plus demographics. The questions included attitude, confidence, experience, and perception types of questions regarding mentorship. For example, "I am able to build positive and healthy mentor/ mentee relationships with my students." "I feel that I have sufficient skills to successfully mentor college students." and, "Overall, how confident are you in mentoring students right now?" Participants were told to rate on a scale of 1-5, 1 being 'least, uncomfortable, or strongly disagree', and 5 being 'most, very comfortable, or strongly agree'. The Post-Workshop Faculty Survey contained 11 five-point Likert-scale questions and one open-ended question. Some additional questions not on the Pre-Workshop Faculty Survey were to investigate if the workshop was effective and/or useful for faculty. For example, "Do you think the workshop is helpful?" "Will you attend future mentoring workshops?" and, "Do you think the workshop is organized well?" etc.

Similar to the student surveys, both faculty surveys went through: (a) a panel of experts which consisted of faculty with background in biomedicine, educational psychology, measurement, mentoring, and research to ensure content validity = 1.0 (after revision) which showed high agreement rate from the panel of experts; and (b) face validity check with a group of faculty (n = 2) and an obtainment of an estimate of time for filling out the surveys. After data collection, both surveys went through: (a) inter-item consistency calculations to show high internal reliabilities of Cronbach's alpha = 0.88 for the Pre-Workshop Faculty Survey and Cronbach's alpha = 0.88 for the Post-Workshop Faculty Survey; (b) EFA (Exploratory Factor Analysis) to validate the instruments and to help group influential factors; and (c) inter-rater reliability calculations from two independent trained research assistants for answers to open-ended questions to show high agreement rate between their ratings ($r = 1.0$).

3.2.4 Data Analysis Methods

Statistical analyses were used due to the nature of quantitative data collected. In addition to aforementioned analyses for reliability and validity, participants' demographic information was collected and their changes in responses were analyzed through EDA (Exploratory Data Analysis), paired t-tests, ES (effect size) calculation, and correlational analysis using SPSS 19.0.

4. Results

Data analysis results from Study 1 were presented first followed by results from Study 2.

4.1 Study 1 Results: Mentoring Workshop Effectiveness for Students

4.1.1 Student Participants' Perceptions

Table 1 shows student participants' self-perception of their ability, attitude, and beliefs as well as student participants' perceptions of the workshop effectiveness. Before the workshop started, the student participants showed relatively high self-perceptions of their ability and attitude. Specifically, student participants (n = 138) yielded a mean of 4.12 (SD = 0.76) on "I am able to get good grades in most of the courses I take" and a mean of 4.28 (SD = 0.77) on "I am aware of my own needs, interests, goals, and strengths and weaknesses." These science-related fields' participants were confident in their ability and knowing themselves regarding their own interests, goals, and strengths and weaknesses. After the workshop, the student participants showed a high self-perception of their belief such that they yielded a mean of 4.59 (SD = 0.76) on "I would like to build good habits to be a successful scientist." Other items will be discussed in the next section.

In addition, these student participants' (n = 133, due to the exclusion of some incomplete post-workshop surveys from students) highly-rated perceptions of workshop effectiveness were reported here. Specifically, the majority expressed that the workshop was helpful (M = 4.65, SD = 0.70), that the workshop was organized well (M = 4.73, SD = 0.62), that they would attend future related workshops (M = 4.63, SD = 0.70), and that the length of the workshop was appropriate (M = 4.48, SD = 0.87). As "5" was the highest possible score, these ratings were very high.

Table 1 Student participants' self-perception and perceptions of workshop effectiveness

Variable	Mean (SD)	N
-Pre-Workshop:		
I am able to get good grades in most of the courses I take.	4.12 (0.76)	138
I am aware of my own needs, interests, goals, and strengths and weaknesses.	4.28 (0.77)	138
-Post-Workshop:		
I would like to build good habits to be a successful scientist.	4.59 (0.76)	133
The workshop is helpful.	4.65 (0.70)	133
The workshop is organized well.	4.73 (0.62)	133
Will attend future related workshops.	4.63 (0.70)	133
The length of the workshop is appropriate.	4.48 (0.87)	133

Among those participants who provided suggestions and feedback in an open-ended question, 20 % suggested that the college offer more workshops and 40 % suggested offer multiple times as well. In terms of topics that student participants suggested, they included mentors' research activities on campus (41.7%) and career choices and opportunities (33.3%) and other topics.

4.1.2 Pre- and Post- Comparisons

Table 2 Student mentoring workshop effectiveness and effect sizes

Variable	Mean (SD) Pre- Workshop	Mean (SD) Post- Workshop	Mean Diff. (SE)	t (df)	P	Cohen's d
More knowledge and skills to be a successful scientist	3.56 (0.92)	4.39 (0.69)	0.827 (0.98)	9.72*** (132)	<.001	1.02
Able to use good habits and strategies to help with scientific research	3.62 (0.97)	4.35 (0.78)	0.729 (0.99)	8.47*** (132)	<.001	0.83
Aware of mentorship support/ resources/ services/ facilities etc.	3.69 (1.10)	4.08 (1.02)	0.389 (0.88)	5.05*** (130)	<.001	0.37
Overall confidence in becoming a successful scientist	3.13 (0.95)	4.20 (0.93)	1.070 (0.98)	11.61*** (113)	<.001	1.14
Believe mentoring for undergraduate students is important to their success	4.65 (0.75)	4.80 (0.57)	0.158 (0.77)	2.37* (132)	.019	0.22
Would like to be a scientist	3.58 (1.29)	4.08 (1.08)	0.504 (1.19)	4.90*** (132)	<.001	0.42

N.B., N = 133 (incomplete data excluded and reflected on df); * $p < .05$; ** $p < .01$; *** $p < .001$

To determine if there were possible changes in participants' ratings before and after the workshop, paired t-tests were run and analyzed. Table 2 shows mean scores and standard deviations (SDs) from the Pre-Workshop Student Survey and the Post-Workshop Student Survey, mean score differences and standard errors (SEs), dependent-samples t-tests results (t statistic and degrees of freedom), *p*-values, and the effect sizes (measured by dependent-samples Cohen's *d*).

From Table 2, student participants yielded significantly higher ratings from the post-workshop survey than those from the pre-workshop survey in obtaining "more knowledge and skills to be a successful scientist" with a large effect size ($M_{diff} = +0.83, SE = 0.98, t_{(df=132)} = 9.72, p < .001, d = 1.02$); in being "able to use good habits and strategies to help with scientific research" with a large effect size ($M_{diff} = +0.73, SE = 0.99, t_{(df=132)} = 8.47, p < .001, d = 0.83$); in being "aware of mentorship support/ resources/ services/ facilities etc." with a small to medium effect size ($M_{diff} = +0.39, SE = 0.88, t_{(df=130)} = 5.05, p < .001, d = 0.37$); in their "overall confidence in becoming a successful scientist" with a large effect size ($M_{diff} = +1.07, SE = 0.98, t_{(df=113)} = 11.61, p < .001, d = 1.14$); in believing that "mentoring for undergraduate students is important to their success" with a small effect size ($M_{diff} = +0.16, SE = 0.77, t_{(df=132)} = 2.37, p = .019, d = 0.22$); and in their belief and interest in becoming a scientist with a medium effect size ($M_{diff} = +0.50, SE = 1.19, t_{(df=132)} = 4.90, p < .001, d = 0.42$).

4.2 Study 2 Results: Mentoring Workshop Effectiveness for Faculty

4.2.1 Faculty Participants' Perceptions

Table 3 shows faculty participants' self-perception of their previous experience in mentoring and as well as faculty participants' perceptions of the workshop effectiveness. Before the workshop started, the faculty participants ($n = 28$) showed a medium average of previous experience in mentoring with a wide variability. Specifically, faculty participants ($n = 28$) yielded a mean of 3.68 ($SD = 1.02$) on "Do you have substantial previous experience in mentoring?" This showed some faculty do not have much previous mentoring experience while some others have substantial previous mentoring experience.

Table 3 Faculty participants' self-perception and perceptions of workshop effectiveness

Variable	Mean (SD)	N
-Pre-Workshop:		
Do you have substantial previous experience in mentoring?	3.68 (1.02)	28
-Post-Workshop:		
The workshop is helpful.	4.77 (0.51)	26
The workshop is organized well.	4.88 (0.33)	26
Will attend future mentoring workshops.	4.77 (0.51)	26
The length of the workshop is appropriate.	4.50 (0.65)	26

In addition, these faculty participants' ($n = 26$, due to the exclusion of two incomplete post-workshop surveys from faculty) highly-rated perceptions of workshop effectiveness were reported here. Specifically, the majority expressed that the workshop was helpful ($M = 4.77, SD = 0.51$), that the workshop was organized well ($M = 4.88, SD = 0.33$), that they would attend future related

workshops (M = 4.77, SD = 0.51), and that the length of the workshop was appropriate (M = 4.50, SD = 0.65). As “5” was the highest possible score, these ratings were very high.

Among those faculty participants who provided suggestions and feedback in an open-ended question, 96.6 % expressed very positive feedback. Suggestions included: make the workshop longer, add group discussions, provide case studies, and hold a future mentoring workshop targeted on all mentoring strategies faculty may need.

4.2.2 Pre- and Post- Comparisons

Table 4 Faculty mentoring workshop effectiveness and effect sizes

Variable	Mean (SD) Pre- Workshop	Mean (SD) Post- Workshop	Mean Diff. (SE)	t (df)	p	Cohen's d
Able to build positive and healthy mentor/mentee relationships with my students	3.92 (0.91)	4.44 (0.71)	0.520 (0.15)	3.38** (24)	.003	0.64
Have sufficient skills to successfully mentor college students	3.76 (0.83)	4.24 (0.72)	0.480 (0.15)	3.12** (24)	.005	0.62
Able to use mentoring strategies to help students conduct, generate, or pursue scientific research	3.68 (1.07)	4.44 (0.71)	0.760 (0.21)	3.61** (24)	.001	0.84
Able to identify my students' needs, interests, goals, and strengths and weaknesses	3.92 (0.95)	4.36 (0.57)	0.440 (0.17)	2.53* (24)	.018	0.56
Aware of mentoring support services/ facilities/ personnel	2.84 (1.25)	3.68 (1.31)	0.840 (0.27)	3.13** (24)	.005	0.66
Overall confidence in mentoring students	4.06 (0.56)	4.53 (0.62)	0.471 (0.13)	3.77** (16)	.002	0.80
Believe mentoring for undergraduate students is important to their success	4.92 (0.28)	4.88 (0.33)	0.040 (0.07)	0.57 (24)	.574	--

N.B., N = 30 (incomplete data excluded and reflected on *df*); * $p < .05$; ** $p < .01$; *** $p < .001$

To determine if there were possible changes in participants' ratings before and after the workshop, paired t-tests were run and analyzed. Table 4 shows mean scores and standard deviations (SDs) from the Pre-Workshop Faculty Survey and the Post-Workshop Faculty Survey, mean score

differences and standard errors (SEs), dependent-samples t-tests results (t statistic and degrees of freedom), *p*-values, and the effect sizes (measured by dependent-samples Cohen's *d*).

From Table 4, faculty participants yielded significantly higher ratings from the post-workshop survey than those from the pre-workshop survey in being "able to build positive and healthy mentor/mentee relationships with my students" with a medium to large effect size ($M_{diff} = +0.52$, $SE = 0.15$, $t_{(df=24)} = 3.38$, $p = .003$, $d = 0.64$); in having "sufficient skills to successfully mentor college students" with a medium to large effect size ($M_{diff} = +0.48$, $SE = 0.15$, $t_{(df=24)} = 3.12$, $p = .005$, $d = 0.62$); in being "able to use mentoring strategies to help students conduct, generate, or pursue scientific research" with a large effect size ($M_{diff} = +0.76$, $SE = 0.21$, $t_{(df=24)} = 3.61$, $p = .001$, $d = 0.84$); in being "able to identify my students' needs, interests, goals, and strengths and weaknesses" with a medium effect size ($M_{diff} = +0.44$, $SE = 0.17$, $t_{(df=24)} = 2.53$, $p = .018$, $d = 0.56$); in being "aware of mentoring support services/ facilities/ personnel" with a medium to large effect size ($M_{diff} = +0.84$, $SE = 0.27$, $t_{(df=24)} = 3.13$, $p = .005$, $d = 0.66$); and in their "overall confidence in mentoring students" with a large effect size ($M_{diff} = +0.47$, $SE = 0.13$, $t_{(df=16)} = 3.77$, $p = .002$, $d = 0.80$). Faculty participants did *not* yield higher ratings from the post-workshop survey than those from the pre-workshop survey in believing that "mentoring for undergraduate students is important to their success" ($M_{diff} = +0.04$, $SE = 0.07$, $t_{(df=24)} = 0.57$, $p = .574$).

5. Discussion

The study investigated students' and faculty's perceptions of the efficacy of the Mentoring Workshops. The literature provided a foundation to expand the current knowledge of mentoring while investigating its effectiveness. Throughout the use of an effective mentoring workshop, faculty and students may be incorporated strategies learned within the mentorship. The results of this study proposed that students and faculty had a positive perception on the effectiveness of mentoring workshop. Participants also included suggestions on how the workshops may be improved.

5.1 Study 1: Workshop Effectiveness for Students

Definitive points are worth mentioning from the first study's workshop aiming to explore the effectiveness of mentoring for students. All participants of the workshop were college students from various science-related majors. There were more female than male participants. In addition, most participants identified themselves as bilingual or trilingual, with English or Spanish as their primary language. A higher rate of participants classified themselves as Hispanic or Latino. Results indicated that the students showed high self-perceptions of their ability, attitude, and beliefs. When examining the participant's perception of the workshop, participants expressed positive feedback. The majority articulated that the workshop was invaluable, organized, and showed high interest in attending future workshops.

5.2 Study 2: Workshop Effectiveness for Faculty

Considerable credits are noted from the second study. There was a total of 30 faculty members from various departments at the study university. The faculty participants attended the Mentoring Workshop held by the Department of Biomedicine in the study university. There were more male

faculty members participating in the workshops than female faculty members. Participating faculty member's ages ranged from 20 to 61. In addition, most faculty participants identified themselves as bilingual or trilingual. A greater rate of faculty participants classified themselves as Hispanic/Latino or White. Results indicated that faculty participants expressed genuine positive feedback. A variety of suggestions were made including: making the workshops longer, adding group discussions, providing case studies, and holding a future mentoring workshop targeting all mentoring strategies faculty may need.

5.3 Implications

Mentoring is a learned skill, however; few faculty and students have had the opportunity to learn how to be effective in a mentoring relationship. The development of an effective mentoring workshop would provide students and faculty to become more adequate within a mentoring relationship. Strategies learned from the workshop may be incorporated within the mentorship. Students can benefit greatly from having an ongoing relationship with a faculty member who understand the institution and can provide academic and personal supports. Furthermore, the skills and abilities acquired from the relationship can be applied in other situations (e.g. graduate studies, or job related functions). An effective mentoring workshop would provide a foundation for faculty and students to develop an effective mentorship.

5.4 Limitations of the Study

One limitation of the study involved the sample size of participants. Although faculty and students' perceptions on the effectiveness of the workshops were positive, a larger sample size would provide a deeper understanding on the participants' perceptions of competencies, abilities, beliefs, and attitudes of the workshops. Another limitation was the institution and department programs included in the study. The study focused on the perceptions of faculty and students within a southern state Hispanic -Serving Institution and the departments of Biomedicine, Biology, Nursing, Exercise Science and Psychology. Perceptions on the effectiveness of the mentoring workshops may vary based on the type of institution and the type of department programs being studied. For instance, in other institutions or departments, the nature of a mentoring program may be different which may generate different patterns of results within the faculty and students' perceptions on mentoring workshops. Thus, the perceptions on the mentoring workshop from other institutions and/or different department programs would provide a deeper understanding on the effectiveness of the workshop. Although the study included limitations, the results proposed students and faculty had a positive perception on the effectiveness of mentoring workshop.

5.5 Directions for Future Studies

Future studies may incorporate suggestions made by the participants, and examine if they may improve the effectiveness of the mentoring workshops. The participants' suggestions included: make the workshop longer, add group discussions, provide case studies, and hold a future mentoring workshop targeted on all mentoring strategies faculty may need. The study investigated students and faculty perceptions of a southern state Hispanic -Serving Institution; future studies may incorporate other institutions' perceptions on the effectiveness of the mentoring workshops.

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Conflict of Interest

None

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