Graduate Student and Faculty Perceptions of Mentoring Competency

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Abstract

The purpose of this needs-assessment was to determine the mentoring competency of faculty at a college of agriculture in a research one land grant institution in the southeast United States. The Mentoring Competency Assessment (MCA) was completed by 171 faculty and 308 students. Chi-square tests of independence were conducted to determine what differences in distribution of responses exist between students and faculty by gender and self-selected area of research. Results showed significant statistical differences in distribution of low-skill evaluations of faculty mentoring competency between students and faculty, by gender, and by self-selected area of research. The results demonstrate the effectiveness of cross-sectional web-based questionnaires on the collection of mentoring data to inform practice for university administrators.

Introduction

Many studies provide evidence that effective mentoring of graduate students by faculty advisors is critical to student productivity, success, and satisfaction in graduate school (Council of Graduate Schools, 2008; Cronan-Hillix et al., 1986; Nettles and Millett, 2006;). Broadly speaking, individuals with mentors report higher satisfaction with their careers, higher average income, a greater number of promotions, and more commitment than those without mentors (Johnson, 2014). In academia, student persistence is associated with student-faculty interaction outside of the classroom. Faculty mentoring of students also leads to higher average GPA and a higher rate of successful course credit completion (Campbell and Campbell, 1997). Mentoring allows faculty to share their knowledge, values, culture, and ethical principles with their mentees, and those who engage in mentoring have tremendous influence over graduate student and junior faculty socialization (Braxton et al, 2011). Graduate students who report greater satisfaction with their faculty mentors are more likely to complete their doctoral dissertation, have shorter time to degree, and report much higher satisfaction with graduate school (Ferrer de Valero, 2005; Tenenbaum et al., 2001). For both PhD students and young faculty, having a mentor improves scholarly productivity in terms of presenting at conferences, publishing articles, and securing grant funding (Johnson, 2016; Nettles and Millet, 2006). Given these consistent findings regarding the influence of mentoring on human capital, it is imperative that university administrators take seriously the impact of mentor skill on graduate education and research.

Graduate education is a critical process for developing

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human capital and is essential to progress and development of the modern world. Many private and public institutions now devote considerable resources to develop and nurture this important commodity. Loew and O'Leonard (2012) reported that in the United States over $14 billion is spent annually for training that supports human capital development. As the investment in human capital has become more important to organizational success, mentoring has become a point of emphasis in organizational research agendas (Erdem and Ozen, 2003). In no sector has this research been more relevant than in higher education where the cultivation of human capital is instrumental to the success of institutions of higher learning.

Research has shown that mentoring students with the specific goal of promoting personal development has a critical influence on leadership development through the acquisition and build-up of psychological capital (PsyCap). PsyCap is made up of four capacities including self-efficacy, hope, optimism, and resilience (Middlebrooks and Haberkorn, 2009). Luthans et al., (2007) research has shown that these capacities are the building blocks that allow individuals to successfully navigate complex situations and relationships by developing "relational caches," which include interpersonal skills such as emotional awareness and compassion (Johnson, 2016; Ragins, 2012). These relational skills can also help students manage the Impostor Phenomena (IP). IP represents an inability of individuals to accurately self-assess their performance (Parkman, 2016). Research shows that IP is pervasive in higher education and there are many aspects of the doctoral education, most notably student dissatisfaction with faculty mentoring ability, that make the effects more pronounced (Parkman, 2016).

Mentoring relationships are extremely context specific. Finding an agreed upon definition in the literature that can be operationalized across disciplines is difficult and some question whether any survey instrument can adequately characterize the term (Jacobi, 1991). In her seminal work, Kram (1985) conceptualized mentoring as an important relationship between an older, more experienced adult and a younger working adult that includes support, guidance, and counsel provided by the advanced adult for the subordinate adult's professional development. From this initial research, two primary types of mentoring functions were identified: career functions and psychosocial functions (Kram, 1985). Career functions included the parts of the mentoring relationship that enhanced the professional development and skills of the mentee. Psychosocial functions encompass tasks that augment interpersonal skills, assist with identity development, and improved overall competence in a mentee's personal life. Despite this research being over 30 years old, scholars continue to study mentoring relationships in the context of career and psychosocial functions (Banerjee-Batist et al., 2019; Kram 1985).

In later research, mentoring was characterized by a relational continuum of mutually beneficial and reciprocal behavior between faculty and students involving a range of career and psychosocial support functions (Johnson, 2016). In graduate student-faculty interactions, mentoring can be seen as a personal and reciprocal relationship between an experienced faculty mentor and a less experienced student mentee in which the faculty acts as a role model and teaches, sponsors, and guides the student towards completion of the graduate degree process and to becoming a full member of a chosen profession (Johnson, 2016). In this context mentoring is often seen as synonymous with advising, supervising, or coaching, but it is distinct from these terms (Johnson et al., 2014).

Advising is a technical process that can be assigned to faculty or staff and deals more with the transmission of information such as degree requirements and academic progress (Weil, 2001). Coaching is almost always provided by external instructors, is instruction-focused, and is generally described as an intervention (Allen and Poteet, 2009). Supervising is generally an assigned responsibility that involves directive behavior of a subordinate by any authority with relevant positional power within the organization (Johnson, 2016). Although each of these associations can develop into a mentoring relationship, it is important to note that they represent distinct, generally transactional affiliations that do not require the relational and psychosocial elements of mentoring (Johnson, 2007). The Mentoring Relationship Continuum (MRC) provides an excellent depiction of mentoring as an activity that is characterized by relative quality in a spectrum and should not be defined by static categories (Figure 1, Johnson et al., 2014).

Although mentoring is now almost universally accepted as a critical component of successful graduate education, previous studies indicate that only 57% of graduate students believe that their primary faculty advisor had become their mentor (Lunsford, 2012). In addition, national studies report that as many as 50% of US doctoral students never complete their graduate programs, and this attrition rate has significant negative consequences for both students, faculty, and administrators within universities (Glatthorn, 1998; Lovitts, 2001; Mullen, 2009). How this perceived lack of mentoring impacts the success of university colleges and departments remains unclear and understanding how mentoring directly impacts academic units through student persistence has become an important goal for administrators in higher education (Mullen, 2009).

Yang et al., (2013) found that mentor training and socialization are critical for faculty as they provide mentoring to graduate students. Previous research on the TEAM-Science approach which provides faculty advisors with mentor training, has shown to be effective at improving faculty-student mentoring outcomes and has been recommended by the Council of Graduate Schools (Byars-Winston et al., 2011, Curtin et al., 2016). It is important to determine the needs of the faculty before implementing any broad mentoring training in an academic institution. However, collecting data on student-faculty mentoring relationships can be difficult, because the nature of mentor-protégé associations in academia are public and political (Golde, 2005). These relationships are sensitive and difficult enough to change that many students in dysfunctional mentoring dyads often quit their degree programs rather than attempt to change faculty advisors (Golde, 2005). One potential work-around for this issue is the use of

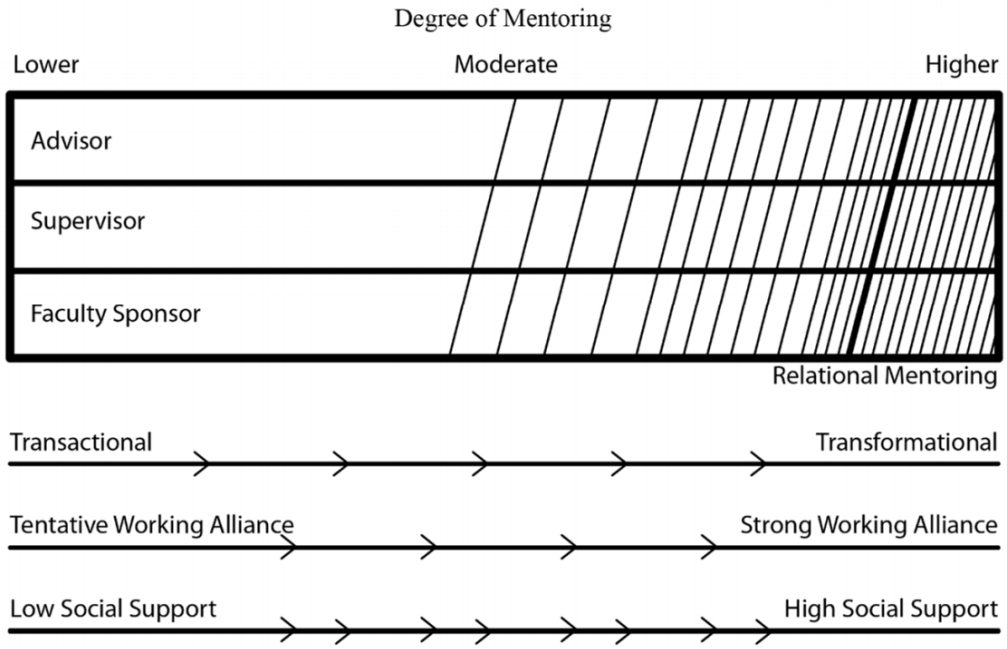

Figure 1. Mentoring Relationship Continuum Model
Johnson, B.W. 2016. On Being a Mentor: A guide for higher education faculty. Routledge. New York, NY.

anonymous web-based surveys designed to collect data on mentoring relationships. Web-based surveys provide participant anonymity and increases the likelihood that respondents will provide sensitive information, which are both important criteria to consider for administrators who seek to understand perceptions of mentoring in academia (Mikulsky, 2005). One additional benefit of web-based surveys is the speed with which they can acquire both mentor and protégé feedback, which prior research has indicated is critical to understanding the nature of mentoring relationships (Allen et al., 2008).

It is critical when selecting an instrument to measure mentoring outcomes that administrators consider the context of the situation and the tool for assessment. Fleming et al. (2013) developed the Mentoring Competency Assessment (MCA), which is a dual-purpose measure that can be used with mentors or proteges in research to evaluate mentoring skills in six competency areas which include: maintaining effective communication, aligning expectations, assessing understanding, addressing diversity, fostering independence, and promoting professional development. Because the instrument is specific to mentoring in academia, has been found to be valid and reliable for both faculty and student use, and is short and easy to disseminate, it provides administrators with an ideal instrument for measuring perceived mentoring skills in academic organizations (Fleming et al., 2013).

Purpose

The purpose of this needs-assessment was to determine student and faculty perceptions of advisor mentoring competency at a college of agriculture in a research one land grant institution in the southeast United States. This effort started as a part of the LEAD21 national leadership program. The goals were to identify and develop mentoring resources and to motivate faculty to make use of training in order to become more effective mentors for graduate students. Of specific interest in this investigation was the impact of gender on graduate student perceptions and faculty self-evaluations of advisor mentoring competency across self-reported area of research. The study was approved as exempt through the Institutional Review Board (IRB) at the university where the college was located. This study was approved as exempt because it poses minimal risk. All participants were provided with an informed consent as a required first question on the web-based questionnaire and were given the option to agree to participate or to decline before continuing.

Methods

The college dean's office created an ad hoc committee with the goal of analyzing the mentoring needs of faculty in order to create a mentor training program within the college. In July 2018, the committee created a web-based questionnaire which included 26 items from the Mentoring Competency Assessment (MCA) and disseminated it to all graduate faculty. The mentor version of the MCA is a self-evaluation that uses a 7-point Likert scale in which 1 = "not at all skilled," 4 = 'moderately skilled," and 7 = "extremely skilled," to assess faculty mentoring competency (Fleming et al., 2013). Two questions were added to the end of the MCA to assess faculty rating of their overall mentoring ability and to determine the extent the faculty felt they were meeting student needs. These questions used the same Likert scale as the MCA. The survey also included thirteen demographic questions, including faculty desire to participate in mentor training, type of training preferred, whether faculty had ever participated in mentor training previously, appointment title, primary appointment type, location, type of research, type of mentee, and years of experience as a mentor. The

Table 1. Characteristics of the University of Florida College of Agricultural and Life Sciences Students and Faculty who Completed the Mentoring Competency Assessment, 2018

Characteristics	Faculty (N=171)	Students (N=308)
Mean age in years (range)	48.38 (28-80)	29.18 (20-68)
Gender, no. (%)		
Female	67 (39.2%)	194 (63.0%)
Male	102 (59.7%)	109 (35.4%)
Other	2 (1.2%)	5 (1.6%)
Race/ethnicity, no. (%)		
White	148 (86.5%)	212 (68.9%)
Hispanic/Latino-White	13 (7.6%)	41 (13.3%)
Black/African American	5 (2.9%)	14 (4.5%)
Hispanic/Latino-Black/African American	0 (0.0%)	2 (0.6%)
Chinese	3 (1.8%)	18 (5.8%)
Asian Indian	4 (2.3%)	6 (1.9%)
American Indian/Alaska Native	0 (0.0%)	2 (0.6%)
Other Asian	4 (2.3%)	18 (5.8%)
Other	2 (1.1%)	26 (8.4%)
Hispanic/Latino-Other	3 (1.8%)	22 (7.1%)
No responses	5 (2.9%)	12 (3.9%)
Category that describes research, no. (%)		
Field	100 (58.5%)	190 (61.7%)
Lab	59 (34.5%)	148 (48.1%)
Social	41 (24.0%)	48 (15.6%)
Theoretical	11 (6.4%)	35 (11.4%)
Other	0 (0.0%)	10 (3.2%)
Location, no. (%)		
Main Campus	125 (73.1%)	221 (71.8%)
Research and Education Center	42 (24.6%)	59 (19.2%)
Other	3 (1.8%)	27 (8.8%)
No response	1 (0.5%)	1 (0.3%)
Previous mentoring training, no. (%)		
With training	32 (18.7%)	20 (6.5%)
Without training	139 (81.3%)	288 (93.5%)

survey was disseminated via the college faculty listserv in July 2018 and remained open for one-month. Two follow-up emails were sent by email through the listserv to remind faculty to participate.

A second web-based questionnaire was sent to graduate students in October 2018 through the college graduate student listserv. This survey included the mentee version of the 26-item MCA (Fleming et al., 2013). The mentee version of the MCA uses a 7-point Likert scale in which 1 = "not at all skilled," 4 = 'moderately skilled," and 7 = "extremely skilled," to assess protégé perceptions of advisor mentoring competency (Fleming et al., 2013). The survey included two additional questions that assessed the overall quality of mentoring received from the primary faculty advisor and the extent to which students felt their needs were being met. The survey included thirteen demographic questions including current degree pursued, part-time or full-time enrollment, online or on-campus, location, type of degrees held, home department, type of research, how many years in current program, and previous mentor training experience. The survey remained open for six weeks and three follow-up emails were sent through the listserv to remind students to participate.

It is important to note that the MCA was previously found to be valid and reliable for mentors and mentees working in academic research settings (Fleming et al., 2013). The coefficient alpha scores for the 26 items on the MCA were 0.91 for mentors and 0.95 for mentees. The 26 items resulted in an acceptable fit to the data for mentors (χ^2 = 663.2; df = 284, p <. 001) and the correlations among

Table 2. Responses to Faculty Survey Demographic Questions

Primary Appointment Type, no. (%)	
Research	88 (51.5%)
Teaching	40 (23.4%)
Extension	40 (23.4%)
Faculty Title, no. (%)	
Professor	64 (26.9%)
Associate professor	41 (24.0%)
Assistant professor	46 (26.9%)
Eminent Scholar/Distinguished Professor	3 (1.8%)
Extension/research professor	2 (1.2%)
Associate extension/research professor	3 (1.8%)
Assistant extension/research professor	5 (2.9%)
Other	7 (4.1%)
Faculty years of experience (years)	
Professor	23.3
Associate professor	13.6
Assistant professor	5.6
Eminent Scholar/Distinguished Professor	38.0
Extension/research professor	22.0
Associate extension/research professor	12.3
Assistant extension/research professor	5.0
Other	19.1
Types of Proteges Mentored, no. (%)	
Junior faculty	59 (34.5%)
Postdoctoral scientists	70 (40.9%)
PhD students	153 (89.5%)
MS students	125 (73.1%)
Undergraduate students	101 (59.1%)
High school students	19 (11.1%)

the six factors ranged from 0.49 to 0.87, with standardized factor loadings ranging from 0.32 to 0.81. Confirmatory factor analysis indicated a confirmatory fit index (CFI) was 0.85 and root mean square error of approximation (RMSEA) was 0.069. For mentees, the six competencies and 26 items also resulted in an acceptable fit to the data ($\chi 2 = 840.62$; df = 284, $p < .001$) and the correlations between the six competencies ranged from 0.58 to 0.92, with standardized factor loadings from 0.56 to 0.86. For mentees the CFI was 0.87 and the RMSEA was 0.08 (Fleming et al., 2013). CFI greater than 0.90 and RMSEA greater than 0.08 suggests goodness of fit.

The populations targeted by the surveys included graduate faculty and students in the college of agriculture which employed 815 faculty with graduate status and enrolled 1,530 graduate students pursuing Ph.D., M.S. with thesis, and M.S. non-thesis degrees. The surveys were

Table 3. Responses to Student Survey Demographic Questions

Current Degree Program, no. (%)	
PhD	197 (64.0%)
MS-Thesis	79 (25.6%)
MS Non-thesis	26 (8.4%)
Average Time in Current Degree (years)	
PhD	2.63
MS-Thesis	1.09
MS Non-thesis	1.40
Enrollment Status, no. (%)	
Full-time	255 (82.8%)
Part-time	53 (17.2%)
Matriculation type, no. (%)	
Face-to-face	265 (86.0%)
Online	40 (13.0%)
Prior Degrees Earned, no. (%)	
AA/AS	28 (9.1%)
BS/BA	236 (76.6%)
MS	145 (47.1%)
PhD	15 (4.9%)
Other	26 (8.4%)

created using Qualtrics and data analysis was conducted using the IBM Statistical Package for the Social Sciences (SPSS) version 25.

Results

The faculty survey received 176 responses, of which 171 (97.2%) were completed and used in the analysis. The student survey received 408 responses, 308 (75.5%) of which were complete and used in the analysis. The response rate for the faculty and student surveys was 21.0% and 20.1% respectively. Table 1 summarizes respondent characteristics from questions that were asked in both surveys. The gender distribution differed between the two surveys, with more men (60.8%) than women completing the faculty survey and fewer male (35.4%) students completing the student survey. Distribution of race and ethnicity also varied between the two groups, with 148 faculty (86.5%) and 212 (68.9%) students identifying as white. Participants identifying as Hispanic/Latino represented the largest minority population for both surveys (faculty N=16, 9.4%, student N=69, 22.4%). The faculty ranged in age from 28 to 80 (48.38) and the students ranged in age from 20 to 68 (29.18). Regarding the question about previous mentor training, only 20 (6.5%) students had received mentor training compared to 32 (18.7%) for the faculty. Both faculty (40.4%) and students (30.2%) selected field research as their primary area of research. Faculty (73.1%) and students (71.8%) who responded to the survey were located predominantly at the main campus location.

Faculty-specific data indicated that 88 faculty (51.5%) had research appointments. Most faculty self-identified as full professors (37.4%) and an almost equal number held titles of associate (26.9%) and assistant professor (24.0%). On average, faculty reported having 15.6 years of experience as a research mentor (0-49). On average, faculty indicated that they mentored 3.08 different types of mentees (0-6) with PhD students being selected most (89.5%, N=153).

The data collected from the student survey (Table 3) demonstrated that 197 (64.0%) respondents were current PhD students and that these students had been active in their current degree program for an average of 2.12 years (0-10). Students were also asked to identify their home department, with 19 being identified. The names of the departments have been omitted, but the average sample was 16.32 students (0-52) per department. 252 (81.9%) students reported being full-time and 246 (79.9%) indicated that they were matriculating face-to-face. Lastly, student responses regarding prior degrees earned indicated that most (76.7%) held at least a Bachelor of Science (BS), and that many (47.1%) also had previously earned a Master of Science (MS).

One important factor noted early in the analysis was the variation in distribution of responses for students and faculty (figure 2). When averaging participant responses across all 26 items, student average scores ranged from 1.00 to 7.00, with a strong negative skew. Average faculty responses across all 26 items ranged from only 3.23 to 7.00. Seventy-two students scored overall average mentoring ability across all 26 items below moderately skilled (4) compared to only twelve faculty. Chi-square tests of independence were conducted to determine if these apparent large differences in frequency of scores were statistically significant.

Three Chi-square tests for independence (tables 4-6) were run (with additional follow-up tests) to determine the relationship between student and faculty perceptions of advisor mentoring competency across gender and self-reported area of research. The Chi-square analysis requires the use of a categorical variable. In order to accommodate this requirement, a new variable was coded to differentiate between respondents who evaluated faculty mentoring ability below four (low-skill) from those who reported four or higher (high-skill) per competency area. The first Chi-square test examined student and faculty responses by all six MCA competency areas to analyze the distribution of high-skill and low-skill results (Table 4). Analysis determined that the distribution of students was significantly greater in the low-skill category in the MCA competencies maintaining effective communication χ^2 (1) = 12.104, p = .001, aligning expectations χ^2 (1) = 13.345, p < .001, assessing understanding χ^2 (1) = 6.292, p = .012, fostering independence χ^2 (1) = 30.088, p < .001, addressing diversity χ^2 (1) = 12.738, p < .001, and promoting professional development χ^2 (1) = 25.577, p < .001 (table 4).

A second Chi-square analysis was conducted to determine the impact of gender on student and faculty distributions of low-skill and high-skill evaluations on the MCA (Table 5). In this analysis, a standardized residual model supported by Agresti (2007) was used because "the omnibus chi-square value does not specify which combination of categories contributes to statistical significance (Beasley and Schumacker, 1995, p.89)." The standardized residual is calculated by taking observed minus expected counts in a cell and dividing by the estimated standard error. A standardized residual with absolute value greater than two with limited cells or about three when there are many cells indicates a lack of fit in a cell (Agresti, 2007). The nominal alpha was adjusted by the Sidak (1967) method (1-(1-α)1/t where t = number of tests run) to control for Type I error rate. With eight cell values being tested per competency, the alpha level for the standardized residuals was α = .00639.

Table 4. Chi-Square Analysis of Student and Faculty Perceptions of Faculty Mentoring Competency by Group

MCA Scores by Competency		Group (standardized residual)			
		Student	Faculty	χ^{2z}	p
1. Maintaining Effective Communication	Low skill	60	13	12.104	0.001
	High skill	247	158		
2. Aligning Expectations	Low skill	72	17	13.345	0.001
	High skill	234	154		
3. Assessing Understanding	Low skill	54	16	6.292	0.012
	High skill	248	155		
4. Fostering Independence	Low skill	75	8	30.088	0.001
	High skill	229	162		
5. Addressing Diversity	Low skill	65	15	12.738	0.001
	High skill	236	156		
6. Promoting Professional Development	Low skill	71	9	25.577	0.001
	High skill	233	162		

[z] df = 1

Table 5. Table 5: Chi-Square Analysis of Faculty and Student Perception of Faculty Mentoring Competency by Gender

		Group (standardized residual[z])			
MCA Scores by Competency		Male student	Female student	Male faculty	Female faculty
1. Maintaining Effective Communication	Low skill	18 (0.41)	41 (2.99)	7 (-2.67)	6 (-1.55)
	High skill	91	152	95	61
2. Aligning Expectations	Low skill	21 (0.22)	50 (3.33)	5 (-4.04)	12 (-0.18)
	High skill	87	143	97	55
3. Assessing Understanding	Low skill	14 (-0.04)	37 (2.60)	6 (-2.77)	10 (0.14)
	High skill	93	153	96	57
4. Fostering Independence	Low skill	21 (0.72)	52 (4.66)	4 (-4.04)	4 (-2.65)
	High skill	86	140	98	63
5. Addressing Diversity	Low skill	14 (-1.03)	49 (4.23)	7 (-3.03)	8 (-1.14)
	High skill	90	143	95	59
6. Promoting Professional Development	Low skill	20 (0.64)	49 (4.29)	2 (-4.51)	7 (-1.48)
	High skill	87	143	100	60

[z] residual >2.73 and <-2.73 significant at corrected p = 0.00639
1. MEC: χ^2 (3) = 13.08, p = .004
2. AE: χ^2 (3) = 19.415, p = .001
3. AU: χ^2 (3) = 10.15, p = .017
4. FI: χ^2 (3) = 32.01, p = .001
5. AD: χ^2 (3) = 19.638, p = .001
6. PPD: χ^2 (3) = 28.90, p = .001

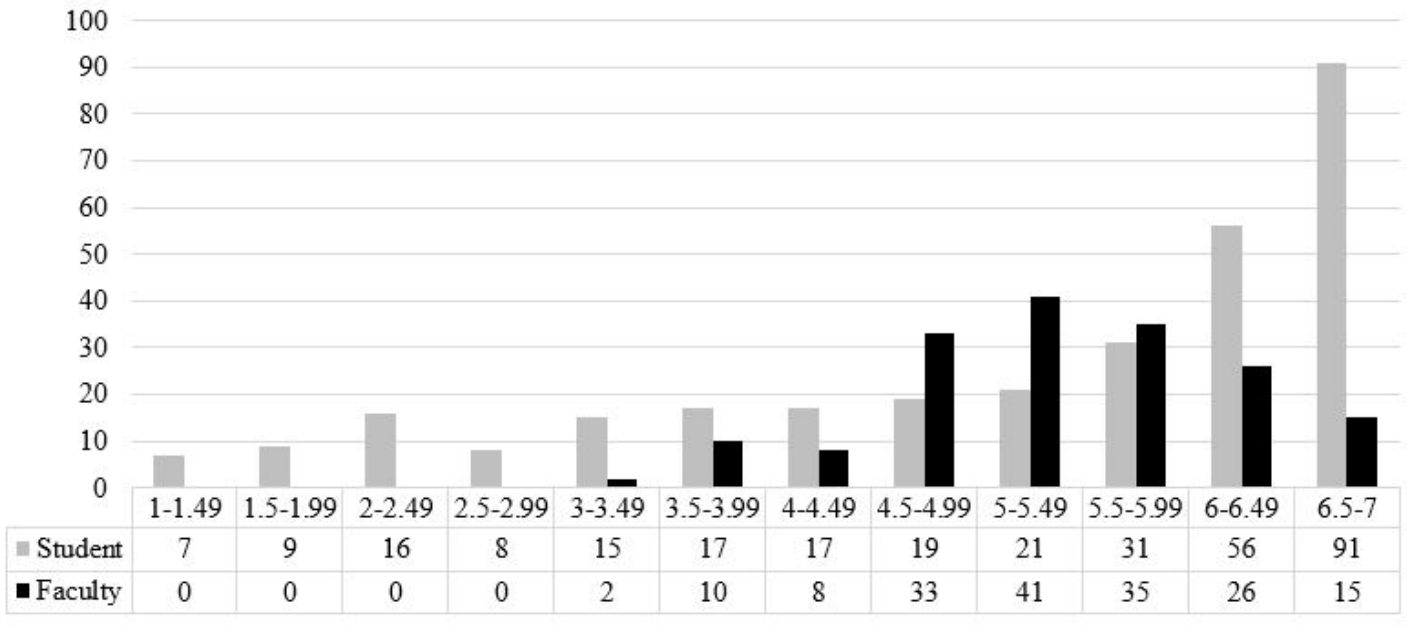

Figure 2. Student and Faculty Average Scores Across All Items of the Mentoring Competency Assessment

Standard residuals greater than 2.73 or lower than -2.73 meet the requirements for significance at p = .00639.

MCA competencies maintaining effective communication χ^2 (3) = 13.08, p = .004, aligning expectations χ^2 (3) = 19.415, p = .001, assessing understanding χ^2 (3) = 10.15, p = .017, fostering independence χ^2 (3) = 32.01, p = .001, addressing diversity χ^2 (3) = 19.638, p = .001, and promoting professional development χ^2 (3) = 28.90, p = .001 all showed significant differences in the distribution of responses based on gender and grouping. Analysis of standardized residuals determined that female students perceived low-skill mentoring from their advisors at a significantly higher rate than male students, male faculty, or female faculty in all MCA competency areas except for assessing understanding (adj. residual = 2.60). In addition, male faculty self-evaluated low-skill at a significantly lower rate than female faculty, female students, or male students in every MCA competency except for maintaining effective communication (adj. residual = -2.67). There were no significant findings for distributions of evaluations in low or high-skill in the male student or female faculty groups (Table 5).

Agresti (2007) suggested that partitioning larger contingency tables into smaller Chi-square analysis may help to ameliorate associations between categories or groups of categories. Given that, two follow up Chi-square tests of independence were run splitting students and faculty to determine within group impact of gender on the distribution of MCA competency scores. In the student group, women had a significantly higher distribution of low-skill evaluations in MCA competency addressing diversity χ^2 (1) = 5.856, p = .016. In the faculty group, women had a significantly higher distribution of low-skill self-evaluations in two MCA competencies including aligning expectations χ^2 (1) = 7.563, p = .006, and promoting professional development χ^2 (1) = 5.777, p = .016. In order to compensate for alpha inflation, a modified Bonferroni adjustment was used to control Type I error (Cohen, 2013). αnew = 1-(1-α)^df/# of tests = 0.0383 because 12 additional tests were done with df = 1.

The final Chi-square test was conducted to determine what additional impact self-reported area of research may have on the student and faculty low-skill and high-skill distributions when also accounting for gender (Table 6). Only three areas of research identified in the questionnaire were analyzed, lab-based research, field-based research, and social science research. There were not enough responses collected from theoretical research or other to be included in this analysis. The standard residual model was used to determine statistical significance of individual cells within the chi-square test (Agresti, 2007; Beasley and Schumacker, 1995. Standardized residuals greater than 2.73 or lower than -2.73 also meet the requirements for significance at p = .00639 in this analysis.

The results of the final chi-square tests indicated significant differences in distribution of low-skill faculty mentoring evaluations based on area of research and gender. For lab-based research, differences were detected for maintaining effective communication χ^2 (3) = 9.365, p = .025, aligning expectations χ^2 (3) = 9.350, p = .025, fostering independence χ^2 (3) = 12.086, p = .007, addressing diversity χ^2 (3) = 11.779, p = .008, and promoting professional development χ^2 (3) = 11.647, p = .009. For field-based research, significant differences were found for all six MCA competencies, including maintaining effective communication χ^2 (3) = 11.993, p = .007, aligning expectations χ^2 (3) = 22.110, p = .001, assessing understanding χ^2 (3) = 8.083, p = .044, fostering independence χ^2 (3) = 28.457, p = .001, addressing diversity χ^2 (3) = 19.514, p = .001, and promoting professional development χ^2 (3) = 24.689, p = .001. No significant differences in distribution of low-skill or high-skill evaluations of mentoring competency were detected for students or faculty in the social sciences.

Standardized residual analysis revealed that female students who selected field-based research evaluated advisor mentoring as low-skill at a significantly higher rate than male students, male faculty, or female faculty across all MCA competency areas except for assessing understanding (adj. residual = 2.68). Male faculty who selected field-based research were significantly less likely to have self-evaluated as low-skill across three of six MCA competency areas including aligning expectations (adj. residual = -4.07) fostering independence (adj. residual = -3.31), and promoting professional development (adj. residual = -3.51). Male faculty were also significantly less likely to self-evaluate as low-skill in lab-based research in three of six MCA competencies, including fostering independence (adj. residual = -2.88), addressing diversity (adj. residual = -2.75) and promoting professional development (adj. residual = -3.51). A significantly greater proportion of female students evaluated faculty mentoring competency as low-skill in lab-based research, but only for addressing diversity (adj. residual = 3.05). No significant findings were found in the proportion of male students or female faculty in low or high-skill distributions (Table 6). In addition, no significant differences in distribution of low-skill or high-skill evaluations were found for the students or faculty who self-selected social science as their primary area of research.

Follow-up chi-square tests were run splitting the data by group (student or faculty) and removing gender from the analysis of area of research (Agresti, 2007). In order to compensate for alpha inflation, a modified Bonferroni adjustment was used to control Type I error (Cohen, 2013). αnew = 1-(1-α)^df/# of tests = 0.0383 because 12 follow-up tests were run with df = 1. In lab-based research, no significant differences were found for MCA competencies in the student group. Lab-based faculty self-evaluated maintaining effective communication χ^2 (1) = 4.475, p = .034 and aligning expectations χ^2 (1) = 4.319, p = .038 as low-skill significantly less than faculty in field-based or social science research. In the social sciences, significantly fewer students evaluated faculty mentoring as low-skill in maintaining effective communication χ^2 (1) = 4.547, p = .033 when compared to all other student groups by area of research. Social science faculty demonstrated significantly more low-skill self-evaluations in promoting professional development χ^2 (1) = 5.197, p = .023. There were no significant differences in distribution found for field-based research when not accounting for gender.

Table 6: Chi-Square Analysis of Faculty and Student Perceptions of Faculty Mentoring Competency by Gender and Area of Research

MCA Competency Scores by Area of Research			Group (standardized residual[z])					
			Male Student	Female Student	Male Faculty	Female Faculty	X^{2y}	p
1. Maintaining Effective Communication	Low skill	Lab	10 (1.11)	15 (1.79)	1 (-2.33)	0 (-1.06)	9.365	0.025
		Field	9 (-0.70)	30 (3.32)	5 (-2.21)	3 (-1.28)	11.993	0.007
		Social	1 (0.03)	3 (0.12)	0 (-1.16)	3 (0.76)	1.563	0.668
	High skill	Lab	49	69	42	16		
		Field	57	90	61	31		
		Social	11	32	13	23		
2. Aligning Expectations	Low skill	Lab	10 (0.54)	18 (2.22)	1 (-2.60)	1 (-1.01)	9.350	0.025
		Field	10 (-0.76)	35 (3.91)	1 (-4.07)	7 (0.32)	22.110	0.001
		Social	1 (-0.80)	6 (0.18)	2 (-0.09)	5 (0.49)	0.749	0.862
	High skill	Lab	49	66	42	15		
		Field	55	85	65	27		
		Social	11	29	11	21		
3. Assessing Understanding	Low skill	Lab	8 (0.31)	15 (2.03)	1 (-2.27)	1 (-0.78)	7.008	0.069
		Field	5 (-1.76)	25 (2.68)	6 (-1.41)	5 (0.05)	8.083	0.044
		Social	1 (-0.17)	4 (0.21)	0 (-1.35)	4 (0.95)	2.223	0.527
	High skill	Lab	51	68	42	15		
		Field	60	94	60	29		
		Social	10	31	13	22		
4. Fostering Independence	Low skill	Lab	11 (0.42)	21 (3.05)	1 (-2.88)	1 (-1.19)	12.086	0.007
		Field	10 (-0.20)	34 (4.81)	2 (-3.31)	0 (-2.73)	28.457	0.001
		Social	1 (-0.41)	7 (1.62)	0 (-1.51)	3 (-0.26)	3.670	0.299
	High skill	Lab	48	62	42	15		
		Field	55	85	64	34		
		Social	10	28	13	23		
5. Addressing Diversity	Low skill	Lab	8 (-0.59)	21 (3.05)	1 (-2.75)	2 (-0.39)	11.779	0.008
		Field	4 (-2.25)	32 (4.41)	5 (-2.05)	3 (-1.16)	19.514	0.001
		Social	2 (0.55)	4 (-0.35)	0 (-1.51)	5 (1.15)	3.185	0.364
	High skill	Lab	51	62	42	14		
		Field	58	88	61	31		
		Social	9	31	13	21		
6. Promoting Professional Development	Low skill	Lab	13 (1.11)	20 (2.10)	1 (-2.94)	1 (-1.23)	11.647	0.009
		Field	8 (-0.71)	32 (4.66)	1 (-3.51)	2 (-1.60)	24.689	0.001
		Social	1 (-0.61)	7 (1.01)	0 (-1.66)	5 (0.67)	3.538	0.310
	High skill	Lab	46	63	42	15		
		Field	57	88	65	32		
		Social	10	28	13			

[z] residual >2.73 and <-2.73 significant at corrected p = 0.00639
[y] df = 3

Discussion

Previous mentoring literature indicates that women in academia frequently report greater isolation, higher stress, lower self-confidence, more difficulty forging relationships with colleagues, and greater work/life balance struggles than their male counterparts (Quinlan, 1999). Research also demonstrates that women's self-concepts are defined by interpersonal relationships, which can cause more pronounced loneliness during the career transitions of early adulthood (Liang et al., 2002). Consequently, mentoring relationships in graduate school can be more important for women than men, and the data from the MCA questionnaire supports that conclusion (table 5). The results in table five and six show that female students evaluate faculty mentoring ability as low-skill (below four on the MCA) at a significantly higher rate than male students across five of six MCA competency areas. This seems to demonstrate that female students perceive that their needs are not being met as well by their faculty advisors when compared to their male colleagues.

When comparing male faculty and female student responses to the MCA the results clearly show a significant pattern. Male faculty are significantly more likely to self-evaluate their mentoring competency as high-skill (more than 4) whereas a disproportionate distribution of female students evaluated mentoring competency as low-skill. MCA competencies fostering independence and promoting professional development represent the largest discrepancy between female student evaluations and male faculty self-assessment in the low-skill category. This supports previous research done by Knox and McGovern (1988) that indicates willingness to allow growth and independence was of critical importance to female mentees. The results of the MCA questionnaire indicate that competencies associated with growth and independence are judged more critically by female students than male students. In addition, female students were significantly more likely than their male peers to evaluate faculty ability to address diversity as low-skill. This finding may indicate that female students are concerned with the ability of male faculty to understand their unique challenges in graduate school and may indicate a critical area of training need for the faculty group. One additional explanation regarding the difference between female student evaluations of advisor mentoring competency and faculty self-assessment is that faculty who overestimate their mentoring ability may be perceived as not being humble, which is a characteristic that mentees may find undesirable in a mentor (Poteat et al., 2009). The results from the Chi-square and standardized residual analysis showed that female faculty were significantly more likely to self-evaluate low-skill mentoring competency than male faculty in two of six MCA competency areas. Given that finding, female faculty may be perceived as humbler and may be evaluated as better mentors by students.

Research studies have shown that different academic disciplines have field-specific structures that influence student variables such as time-to-degree and completion rate (Zwick, 1991). One example is the difference between the context of daily work between students in lab science and social science. Graduate students in the biological sciences conduct most of their research in a structured laboratory setting with frequent contact and intervention from the primary advisor. Conversely, students in the social sciences typically do most of their research work in isolation, with less contact from the primary advisor and significantly fewer financial resources (Golde and Dore, 1991; Tinto 1993). Rose (2005) theorized that student mentoring needs would therefore vary by discipline, but her survey of 635 doctoral students did not find significant differences between student's ratings of the ideal mentor. However, the MCA questionnaire found significant differences in student and faculty responses based on self-identified area of research (table 6).

The largest differences in low-skill evaluations of faculty mentoring were uncovered in field-based research but only when accounting for gender. Female students and male faculty differed dramatically in their evaluations of advisor mentoring competency in field-based research. Female students in field-based research had the highest distribution of low-skill evaluations compared to all other groups. In contrast, social science faculty self-assessed their overall mentoring quality similarly to the social science students. In addition, social science students rated faculty mentoring competency in maintaining effective communication as low-skill at a significantly lower rate than their student peers in other disciplines. Despite apparent social science student satisfaction with faculty mentoring ability, social science faculty self-evaluated their mentoring competency in promoting professional development as low-skill at a significantly higher rate than faculty in lab-based or field-based research. Meanwhile, lab-based faculty self-evaluated their mentoring competency as high-skill at a significantly greater rate than their peers in field or social sciences for maintaining effective communication and aligning expectations. One possible explanation for the difference across area of research is the presence of unique organizational structures or cultures that may be impact the evaluation of faculty mentoring ability within academic departments. Most importantly, the data shows a disconnect between faculty self-evaluations of mentoring ability in the lab and field-based sciences and the students pursuing degrees in those disciplines. Only in the social sciences do the faculty appear to be evaluating themselves more in line with student perceptions of faculty mentoring competency.

Mentoring relationships evolve over time and through phases and can be either formal or informal in nature (Kram, 1985). In academia, informal mentoring occurs when a faculty mentor and prospective mentee have a mutual desire to begin a mentoring relationship. Formal mentoring generally develops through departmental intervention where one or both members have a choice in the development of the relationship (Cobb et al. 2018). Research indicates that informal mentoring relationships provide universally superior outcomes for mentees over formal mentoring relationships (Chao and Gardener, 1992; Cobb et al., 2018; Ragins and Cotton, 1999). The nature of the mentoring relationship is important to consider when

Summary

The purpose of this needs-assessment was to determine the mentoring competency of faculty at a college of agriculture in a research one land grant institution in the southeast United States. Data was collected from graduate students and faculty during summer and fall 2018 in order to determine the mentoring needs of both groups. Overall, students and faculty had significant differences in the distribution of scores for faculty mentoring competency across all six MCA competency areas. In addition, significant differences were found based on gender and area of research. These findings suggest that faculty in lab-based and field-based research at this college of agriculture need more training on effective mentoring strategies, especially as it relates to working with female graduate students. It is imperative when conducting needs assessments of this type to seek information from both students and faculty in order to create the clearest picture of training needs within academic institutions. The training needs across departments may vary dramatically based on the culture, perceptions, the skills of faculty in providing career development, social support, and relational mentoring, and the amount of support students perceive is necessary to be successful. Further research should be conducted at the department level to better understand the specific mentoring needs of graduate students and within specific mentoring dyads.

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