

Exploring Teaching-Focused Networks of Agriculture University Faculty Members: A Mixed-Methods Egocentric Network Approach

Abstract

Faculty members' network characteristics influence their teaching and the types of information they acquire. Given the gap in empirical knowledge on agriculture university faculty members' teaching-focused networks, this mixed-methods study focused on identifying characteristics of agriculture university faculty members' teaching-focused personal networks. We also investigated why faculty members communicated and what topics they discussed with their teaching-focused contacts. Social network theory (Borgatti & Halgin, 2011) and social capital theory (Lin, 2001) guided this study. Utilizing egocentric network analysis, we found that agriculture university faculty members typically communicated with a few close individuals within their departments and in the same discipline. Further, the qualitative study indicated that faculty members' main rationales for interacting with their teaching-focused contacts were their contacts' expertise in teaching and subject matter, personal and professional relationships, and approachable personality. In addition, faculty members communicated with their contacts for advice and feedback, information and resources about teaching, administrative matters, and emotional support. The findings showed that faculty participants' teaching-focused contacts significantly benefited their teaching enhancement and professional development. The study offers valuable insights into faculty members' teaching-focused personal networks and implications for faculty instructional development.

Keywords: *agriculture university faculty, higher education teaching, teaching-focused personal network, instructional development*

Introduction

Social interactions play a critical role in university faculty members' teaching and professional development by allowing them to access teaching-related knowledge, information, and support (Benbow & Lee, 2019; Benbow & Lee, 2020; Patarraia, Falconer, et al., 2014). Engaging in dialogue regarding their teaching can promote reflection on their teaching practice and influence their teaching beliefs and approaches (Rienties & Hosein, 2015). Teaching-focused personal networks are defined as university faculty members' networks in which they can access knowledge, information, and support from their contacts about teaching (Benbow & Lee, 2020). Teachers perceive new information through social mechanisms and networks, and such social interactions among teachers are valuable for developing effective and innovative teaching practices (Baker-Doyle & Yoon, 2011; Van Waes et al., 2018). Thus, higher education institutions should promote interactions among instructors to enhance their teaching practices and address diverse students' needs (Van Waes et al., 2018).

While social interactions can help faculty members access valuable resources and information for their teaching, not all networks are equal (Niehaus & O'Meara, 2015). Depending on the structure and content of the network, the benefits from those networks can be significantly different (Niehaus & O'Meara, 2015). This means the networks' characteristics influence faculty members' teaching and the types of information they acquire (Patarraia, Margaryan, et al., 2014). To explore teachers' interactions and resources embedded in their networks, previous studies utilized the social network approach, which focuses on individuals and relationships among them

(Perry et al., 2018). These studies have established the importance of teachers' interactions for social capital development (Benbow et al., 2021; Fox & Wilson, 2015), instrumental and expressive values (Van Waes et al., 2015), job attitudes (Thomas et al., 2019), and school reform (Penuel et al., 2009).

In particular, the social network approach has offered a useful framework for identifying interactions and networks of K-12 teachers (Baker-Doyle & Yoon, 2011; Fox & Wilson, 2015; Penuel et al., 2009; Spillane et al., 2015; Thomas et al., 2019) and post-secondary instructors (Benbow & Lee, 2019; Patariaia, Falconer, et al., 2014; Patariaia, Margaryan, et al., 2014; Rienties & Hosein, 2015; Roxå & Mårtensson, 2009; Van Waes et al., 2015; Van Waes et al., 2018). While the aforementioned studies demonstrated the significance of such teaching-focused networks, there are still gaps in empirical research on the characteristics and quality of university faculty members' teaching-focused networks using a mixed-methods approach. In particular, given that few studies about agriculture university faculty members' teaching-focused networks exist, we used a mixed-methods egocentric network approach to provide a holistic understanding of agriculture university faculty members' teaching-focused personal networks.

Theoretical Framework

The theoretical frameworks for this study were based on social network theory (Borgatti & Halgin, 2011) and social capital theory (Lin, 2001). These theories provided a valuable lens for understanding faculty members' teaching-focused personal networks and the outcomes of those networks. In this study, social network theory offered a useful lens to explain the interactions of university faculty members and identify the characteristics of faculty members' networks related to teaching. Additionally, social capital theory provided a framework to describe how their teaching-focused networks affected their social capital and identify different types of outcomes of social interactions.

Social network theory explains that a social network involves individuals and social ties between them (Benbow & Lee, 2020; Patariaia, Margaryan, et al., 2014; Perry et al., 2018). The theory posits that social interaction and dialogue are critical for teachers' professional learning by exchanging ideas, resources, and experiences (Patariaia, Margaryan, et al., 2014). Thus, one's social network characteristics influence their knowledge, the types of information and resources they have (Patariaia, Margaryan, et al., 2014), and their behavior and performance (Van Waes et al., 2018).

Social network approaches are broadly categorized into two types: the whole network approach and the egocentric (personal) network approach (Benbow & Lee, 2020). While the whole network approach focuses on the structure and content of social ties among defined groups of individuals, the egocentric network approach looks at distinct networks of social relations among unbounded groups of individuals (Benbow & Lee, 2020). We used an egocentric network approach as this study focused on faculty members' teaching-focused networks within their own network boundaries, including their institutions and beyond, not within predefined groups such as professional development programs or their affiliated departments. An egocentric network involves egos, alters, and ties. Egos can be individuals, groups, or organizations (Van Waes et al., 2015). Alters include the people that an individual interacts with within their network. In this study, egos were conceptualized as faculty participants, and alters were considered participants' contacts in their teaching-focused network (e.g., departmental colleagues, Ph.D. cohorts). The relations that egos (faculty participants) have with alters (contacts) are ties (Van Waes et al., 2015). Ties between egos and alters represent the interactions and interchange of resources, knowledge, materials, and advice (Patariaia, Margaryan, et al., 2014).

Further, social capital theory highlights that social networks are valuable assets (Field, 2017). Social capital is defined as resources, information, and expertise embedded in social networks that individuals can access through social ties (Penuel et al., 2009; Lin, 2001). Social capital is critical for human capital development, such as individuals' knowledge and skill advancement, particularly in knowledge-intensive organizations (Spillane et al., 2015). In this study, social capital theory was used to conceptualize how faculty members access, mobilize, and benefit from their social capital regarding teaching.

Purpose and Objectives

The purpose of this study was to identify the characteristics of agriculture university faculty members' teaching-focused personal networks. The following objectives guided this study:

1. Describe compositional characteristics of faculty members' teaching-focused personal networks.
2. Describe structural characteristics of faculty members' teaching-focused personal networks.
3. Identify factors that influenced the formation of faculty members' teaching-focused networks.
4. Identify topics that faculty members discussed with their teaching-focused contacts.

Methodology

Research Approach

We utilized an explanatory sequential mixed-methods approach (Creswell & Plano Clark, 2018) to provide a holistic understanding of university faculty members' teaching-focused personal networks. The approach consisted of a quantitative phase and a qualitative follow-up phase. In the quantitative phase, we focused on identifying their networks' characteristics using surveys. In the qualitative phase, we interviewed faculty participants to extend the quantitative results about participants' teaching-focused personal networks by providing in-depth information regarding their teaching-focused networks, such as topics discussed and factors influencing the formation of ties between faculty members and their contacts.

Target Population and Sample

The target population in this study was faculty members in the College of Agricultural and Life Sciences (CALs) at the University of Florida (UF). A convenience sampling approach was used to collect data. The sample for this study was current university instructors at UF who participated in Teacher's College, an instructional development program, between 2014 and 2020 ($N = 127$). Because we used non-probability sampling, the results of this study cannot be generalized to the population, and caution must be taken when interpreting the results.

Study Participants

Quantitative Study Participants

A total of 61 faculty members from 18 departments within UF CALs completed the quantitative portion of this study, which indicated a 48% response rate. Of those 61 survey respondents, 50.8% ($n = 31$) were male and 49.2% ($n = 30$) were female. Regarding race/ethnicity, over half of the sample (62.3 %; $n = 38$) were White, 14.8 % ($n = 9$) were Asian, and 11.5 % ($n =$

7) were Hispanic, Latino, or Spanish origin. The remaining 11.5 % ($n = 7$) were from other race/ethnicity groups (Black, more than two races). In terms of position, 60.7 % ($n = 37$) were assistant professors, and 9.8 % ($n = 6$) were associate/full professors. Non-tenure track faculty members (lecturers) were 27.8 % ($n = 17$) of the sample. The remaining one participant did not provide the information. Regarding academic disciplines, the majority of the survey respondents (70.4 %; $n = 43$) were in natural and applied sciences area, while 23.0% ($n = 14$) were in social science fields.

We compared early and late respondents to address the nonresponse error (Ary et al., 2014; Lindner et al., 2001). The early respondent group was comprised of the first half of the respondents ($n = 31$). The second half of the respondents ($n = 30$) who completed the survey after the final two reminders were grouped into the late respondent group (Lindner et al., 2001). The network sizes for early and late respondents were compared using an independent samples t-test. There was no statistically significant difference between the scores of the early respondent group ($M = 4.13$, $SD = 2.20$) and the late respondent group ($M = 4.80$, $SD = 3.47$), $t(58) = -0.89$, $p = 0.38$, $d = -0.23$, indicating that the respondents were an unbiased sample (Ary et al., 2014).

Qualitative Study Participants

A total of 14 faculty members participated in the qualitative phase. The interview participants were composed of seven assistant professors and seven lecturers. While we invited all survey respondents to the follow-up interviews, participants in associate and full professor positions were unwilling to participate in the interviews. Regarding interview participants' discipline areas, seven were in natural and applied sciences areas, and seven were in social science fields. As for sex, ten were female, and four were male. In terms of race/ethnicity, ten participants identified as White, three were Hispanic, Latino, or Spanish origin, and one was Asian. Interview participants were assigned a code (F1, F2, F3, etc.) based on the alphabetical order of their names to maintain confidentiality.

Instruments

Quantitative Study Instrument

We developed the survey questionnaire based on the egocentric (personal) network literature (Benbow & Lee, 2019; Halgin & Borgatti, 2012; McCarty et al., 2019; Perry et al., 2018). The personal network survey questionnaire was comprised of three major sections: (a) network size, (b) compositional measures, and (c) structural measures. A panel of faculty members in agricultural education and/or program evaluation reviewed the instruments for face and content validity. Test-retest reliability was not implemented given the respondents' burden and time, which is a limitation of this study. In the last section of the questionnaire, we asked respondents to provide demographic information such as affiliated department, current position, sex, and race.

Network Size. Network size refers to the number of contacts in an individual's personal network (Benbow et al., 2021). In this study, the network size represented the number of faculty members' teaching-focused contacts (Benbow & Lee, 2019). To identify a respondent's teaching-focused network size, respondents were asked to indicate the number of their contacts related to teaching matters with the following question: "Within the last 12 months, how many different people have you sought advice about teaching from?" The respondents were then asked to list up to six individuals with whom they generally discuss teaching practices (Benbow & Lee, 2019). We limited survey respondents to list up to six contacts because egocentric network methodological

research has indicated that six is the optimal maximum number of possible contacts to identify significant personal network ties and mitigate respondents' burden (Benbow & Lee, 2019).

Compositional Measures. Personal network compositional measures focus on identifying the characteristics of an ego's alters and relationships (Halgin & Borgatti, 2012). Personal network compositional measures included (a) alter attributes, (b) homophily (ego-alter similarity), and (c) heterogeneity (alter-alter difference) (Perry et al., 2018). In this study, alters' attributes included each contact's organizational affiliation, position, sex, and race. First, organizational affiliation had five different categories: (a) same department at the same institution, (b) different department at the same institution, (c) same discipline at another institution, (d) different discipline at another institution, and (e) outside of higher education. In addition, types of positions were categorized into nine groups: (a) lecturer, (b) senior lecturer, (c) master lecturer, (d) assistant professor, (e) associate professor, (f) full professor, (g) education specialist, (h) administrator, and (i) other.

Second, homophily refers to the individual's tendency to establish ties with those similar to oneself on socially significant attributes (e.g., race, sex, education, and social class) (Halgin & Borgatti, 2012; Patariaia, Margaryan, et al., 2014; Perry et al., 2018). In other words, homophily presents the similarity between the ego and its alters. We calculated the *E-I* index (Krackhardt & Stern, 1988) using E-Net (Borgatti, 2006) to identify the homophily score of categorical alter attributes, including organizational affiliation, position, sex, and race. The *E-I* index is measured by calculating the number of alters different from ego (external ties *E*; those who are in a different attribute category), subtracting the number of alters the same as ego (internal ties *I*; those who are in the same attribute category) and then dividing the result by the number of alters (network size) (Halgin & Borgatti, 2012; Krackhardt & Stern, 1988; Perry et al., 2018). Because the *E-I* index is a reverse measure of homophily, a larger number indicates greater heterophily (Perry et al., 2018).

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Further, heterogeneity focuses on the diversity among alters in an egocentric network (Perry et al., 2018). We calculated Blau's index using E-Net (Borgatti, 2006) to identify the heterogeneity of alters in each respondent's personal network regarding categorical alter attributes, including organizational affiliation, position, sex, and race. Higher values of Blau's index indicate greater levels of heterogeneity among alters, which indicates more diversity among alters (Perry et al., 2018).

In addition, the strength of ties between ego and alters was measured by the intensity (closeness) of relationships between ego and alters within the network (Perry et al., 2018). Respondents were asked to indicate the extent to which they felt close to each listed individual (contact) using five-point Likert-type scales ranging from 1 (very distant) to 5 (very close). We created a "weak ties" variable by combining the values of closeness levels 1 (very distant), 2 (distant), and 3 (neither distance nor close), and made a "strong ties" variable by adding together the values of closeness levels 4 (close) and 5 (very close) (McCarty et al., 2019).

Structural Measures. Structural measures of personal networks focus on the structural characteristics of faculty members' teaching-focused network, which is identified by collecting data about ties among alters (McCarty et al., 2019). We identified the structural characteristics of faculty respondents' (egos) networks using density, which is defined as a measure of the degree of connectedness of alters in a network (McCarty et al., 2019; Perry et al., 2018). Respondents were asked to report if each pair of alters they named knew each other (Perry et al., 2018), to the best of their knowledge, on the adjacency matrices using three-point scales (0 = no, 1 = yes, 5 = I do not

know). The density of an ego network was calculated by counting the number of ties among the alters divided by the total number possible (Perry et al., 2018). In short, density is the percentage of ties that exist out of all possible ties. It ranges from 0 (no alter is connected to any other) to 1 (every alter is connected to every other) (McCarty et al., 2019).

Qualitative Study Instrument

Participants' teaching-focused personal networks were created using E-Net based on their survey responses before conducting interviews. The interview questions were developed to collect more in-depth information about faculty members' teaching-focused personal networks, such as their relationship with teaching-focused contacts, topics that were discussed with the contacts, and factors influencing the formation of the teaching-focused network (Table 1). A panel of experts, consisting of three faculty members and three graduate agricultural education students, reviewed the instrument to determine its face and content validity.

Table 1

Interview Questions Regarding Faculty Members' Teaching-Focused Personal Networks

Categories	Interview Questions
Relationship with teaching-focused contacts	Q. Describe each person you communicated with regarding teaching.
Topics that were discussed with the contacts	Q. What teaching topics did you discuss with this person?
Factors influencing the formation of the teaching-focused network	Q. Why did you communicate with this person about teaching?

Data Collection

Quantitative Data Collection

The study consisted of two stages of data collection procedures, including the quantitative and qualitative data collection phases. First, we used an online Qualtrics survey to collect quantitative data. Dillman's Tailored Design Method was utilized to encourage survey response and ensure data quality (Dillman et al., 2014). In October 2020, the Dean of the UF/IFAS College of Agricultural and Life Sciences sent the first survey invitation email to the sample to encourage them to participate in the survey. As a follow-up, the principal investigator sent each respondent personalized reminder emails for a total of four solicitations to help increase the response rate (Dillman et al., 2014).

Qualitative Data Collection

Qualitative data were collected from those survey respondents who volunteered for the follow-up interviews. The principal investigator conducted semi-structured interviews via Zoom between October 2020 and January 2021. The interview questions focused on identifying topics that were discussed with faculty members' teaching-focused contacts and factors that influenced the formation of their teaching-focused networks. Participants were provided interview questions before their interviews and were asked to reflect on their teaching-focused person network. Each interview lasted approximately 60 to 90 minutes, and interviews were video-recorded and transcribed verbatim.

Data Analysis

Quantitative Data Analysis

We analyzed the quantitative data using Statistical Package for the Social Sciences (SPSS) and E-Net (Borgatti, 2006). We identified the average size of respondents' teaching-focused networks using SPSS. Utilizing E-Net, we calculated the frequency and percentage of alters' attributes (Halgin & Borgatti, 2012) and identified compositional and structural characteristics of faculty members' teaching-focused personal networks. In addition, E-Net was utilized to visualize each faculty respondent's network.

Qualitative Data Analysis

All interview transcripts were processed using the QSR NVivo software. The data obtained from the interviews were analyzed through the constant comparative method (Corbin & Strauss, 2008) to identify similarities and differences between cases in the data set (Harding, 2019). The coding process included three major stages: open coding, axial coding, and selective coding (Corbin & Strauss, 2008). During open coding, we read each transcription line-by-line and created descriptive codes by breaking down the textual data of the interview transcripts into small, distinct parts (Corbin & Strauss, 2008). In axial coding, we developed main categories and subcategories by finding connections between the codes generated during the open coding process (Ary et al., 2014). Selective coding was then used to identify how the categories were related (Ary et al., 2014). Finally, we used codes and categories to describe our findings.

To meet standards for trustworthiness, we identified the credibility, dependability, confirmability, and transferability of the qualitative data (Lincoln & Guba, 1985). First, peer debriefing was used to ensure the credibility of qualitative data. The researchers in this study critically examined the principal investigator's qualitative data analysis process and interpretations to ensure the credibility of the data (Ary et al., 2014). We also utilized intrarater and interrater agreements to assess the dependability of our qualitative data findings. For example, during the process of interrater agreement, if we found any discrepancies in the coding, coders discussed and reconciled them through consensus (Syed & Nelson, 2015). Additionally, we used an audit trail to ensure confirmability, and we provided detailed and thick descriptions of the context and participants to establish the transferability of the findings (Ary et al., 2014).

Results

Objective 1. Describe Faculty Teaching-Focused Personal Network's Compositional Characteristics

The survey data were used to generate faculty respondents' teaching-focused personal networks. The result indicated that the average network size of the respondents was 4.47 ($SD = 2.90$; Min: 0, Max: 13). Further, we identified the compositional characteristics of respondents' teaching-focused personal network, including (a) alter attributes, (b) homophily (ego-alter similarity), and (c) heterogeneity (alter-alter difference). The results are described below.

Alter Attributes

In this study, alters were conceptualized as faculty respondents' contacts who communicated with them about teaching, and alter attributes referred to each contact's organizational affiliation, position, sex, race, and closeness of relationships between faculty

respondents and their contacts. The results indicated that while their teaching-focused contacts' organizational affiliations occurred across various departments and institutions, most of their teaching-focused contacts were within the same department and institution. In detail, 64.6% ($n = 146$) of their contacts were their departmental colleagues, and 21.7% ($n = 49$) were in different departments at the same institution. Further, 8.8 % ($n = 20$) were in the same discipline at other institutions, and 4.4% ($n = 10$) were in different disciplines at other institutions.

In terms of the contacts' positions, the highest percentage group was assistant professors (24.3%; $n = 55$), followed by full professors (23.9%; $n = 54$), associate professors (17.3%; $n = 39$), lecturers (10.6%; $n = 24$), education specialists (10.6%; $n = 24$), administrators (7.1%; $n = 16$), and others (4.4%; $n = 10$). Regarding race, the majority were White (77.9%; $n = 176$), followed by those of Hispanic, Latino, or Spanish origin (7.5%; $n = 17$), two or more races (7.1%; $n = 16$), Asian (4.0%; $n = 9$), and Black or African American (2.2%; $n = 5$). Of these contacts, 50% ($n = 113$) were male, and 49.1% ($n = 111$) were female. The remaining two individuals did not provide the information. Lastly, faculty participants tended to communicate about teaching with their strong ties. The results indicated that 65% ($n = 147$) of their contacts were strong ties, and 35% ($n = 79$) were weak ties. Table 2 describes the overview of faculty respondents' alters (contacts) attributes.

Table 2

Alters Attributes Regarding Affiliation, Position, Sex, Race, Closeness, and Tie Strengths

Variables	Categories	<i>n</i>	%
Affiliation	Same department at the same institution	146	64.6
	Different department at the same institution	49	21.7
	Same discipline at other institution	20	8.8
	Different discipline at another institution	10	4.4
	Outside of higher education	1	0.4
Position	Lecturer	24	10.6
	Senior Lecturer	3	1.3
	Master Lecturer	1	0.4
	Assistant Professor	55	24.3
	Associate Professor	39	17.3
	Professor	54	23.9
	Education Specialist	24	10.6
	Administrator	16	7.1
	Other	10	4.4
Sex	Male	113	50.0
	Female	111	49.1
	Not disclosed	2	0.9
Race	White	176	77.9
	Black or African American	5	2.2
	Hispanic, Latino, or Spanish origin	17	7.5
	Asian	9	4.0
	Two or more races	16	7.1
	Not disclosed	3	1.3

Closeness	Very distant	3	1.3
	Distant	14	6.2
	Neither distant nor close	62	27.4
	Close	97	42.9
	Very close	50	22.1
Tie Strength	Weak ties	79	35.0
	Strong ties	147	65.0

Note. Weak ties– combined values of “neither distance nor close,” “distant,” and “very distant”; Strong ties – combined values of “close” and “very close.”

Homophily & Heterogeneity

Homophily (ego-alter similarity) and heterogeneity (alter-alter difference) were measured using E-Net. First, we calculated the *E-I* index to measure homophily, which is the similarity between ego and alters (Halgin & Borgatti, 2012). The overall *E-I* indexes for affiliation, position, sex, and race were -0.29, 0.49, -0.16, and -0.11, respectively. Since the *E-I* index is a reverse measure of homophily, a larger number indicates greater heterophily (Perry et al., 2018). The results showed that the faculty participants tended to communicate with those in the same affiliation and different positions. Regarding sex and race, participants were more likely to discuss teaching with those in the same category (i.e., If faculty members were male, they mainly communicated with other males about teaching; If faculty members were White, they mostly communicated with other White faculty).

Further, we measured heterogeneity by calculating Blau’s index scores regarding alters’ attributes, including their organizational affiliation, position, sex, and race. The overall means of Blau’s index for alter attributes regarding affiliation, position, sex, and race were 0.27, 0.50, 0.31, and 0.18, respectively. The results indicated faculty participants’ alters (contacts) were mostly the same regarding affiliation, position, sex, and race. In other words, participants’ teaching-focused contacts did not represent great diversity concerning affiliation, position, sex, and race. The statistical results of homophily (*E-I Index*) and heterogeneity (*Blau’s Index*) are presented in Table 3.

Table 3

Statistical Results of E-I and Blau's Index

Categories	<i>E-I Index</i>	Blau’s Index
Affiliation	-0.29	0.27
Position	0.49	0.50
Sex	-0.16	0.31
Race	-0.11	0.18

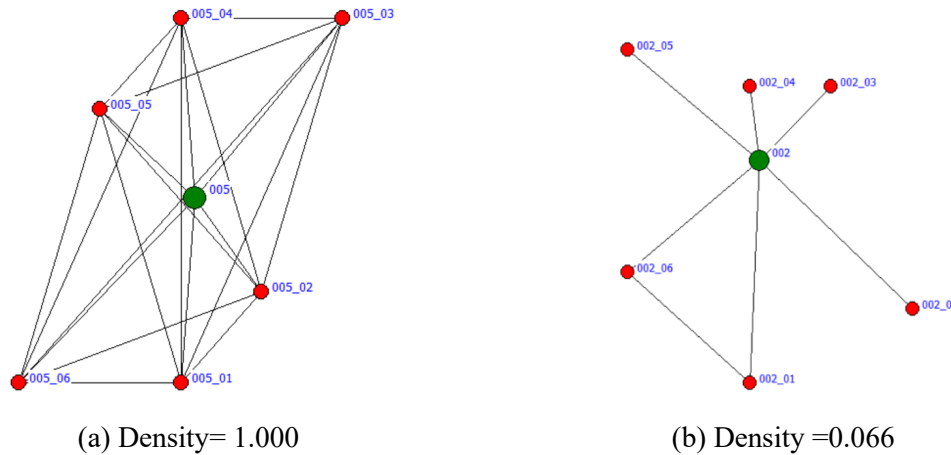
Objective 2. Describe Faculty Teaching-Focused Personal Network’s Structural Characteristics (Alter-Alter Ties)

We calculated the density of the faculty respondents’ networks to identify the structural characteristics of faculty respondents’ teaching-focused personal networks. The result indicated that the average density of respondents’ networks was 0.326, showing that 32.6% of possible ties (relationships) existed. As depicted in Figure 1, the densest network’s density was from ego 5, who

had a density of 1.000, indicating that all their alters know each other (all possible ties exist). The least dense network was from ego 2, with a density of 0.066, indicating that 6.6% of the possible relations existed.

Figure 1

Egocentric Network Examples (Network Size = 6) with Different Densities



Note. A green dot presents egos, and a red dot indicates alters; ties between ego and alters present the extent to which an ego feels close to alters (closeness), and ties between alters indicate whether they know one another (acquaintance).

Objective 3. Identify Factors that Influenced the Formation of Faculty Members' Teaching-Focused Networks

During the qualitative phase, faculty participants were asked to describe why they communicated with their contacts about teaching. We found that the main rationales for faculty participants to communicate with their contacts included (a) expertise of contacts in teaching and subject matter, (b) personal and professional relationships (i.e., mentoring relationships, collegial relationships, friendships, hierarchical relationships), and (c) approachable personality (feeling comfortable and supported).

Expertise in Teaching and Subject Matters

Several faculty participants (F1, F2, F3, F7, F9, F11, F12, F14) indicated that expertise in teaching was one of the critical factors encouraging them to engage in conversation with their contacts about teaching. Participants mentioned that they communicated with recognized effective instructors who demonstrated expertise, innovativeness, and success in teaching. For example, F3 shared, "She is also extremely innovative in her teaching practices. I see her as a model teacher." Communicating with these effective and innovative teachers helped improve their teaching practices by encouraging them to think outside the box. Further, participants mentioned that they communicated with instructional designers from various faculty instructional support centers in their institution, such as the Center for Instructional Technology and Teaching (CITT), the Center for Teaching Excellence (CTE), the Center for Online Learning and Technology (COLT), and the Center for Online Innovation and Production (COIP). Participants stated that their participation in instructional development programs and workshops helped them

connect and work with these instructional designers with expertise in designing and delivering courses and creating instructional materials.

Some faculty participants (F3, F5, F7) indicated that expertise in a subject area they teach was one of the key considerations when they reached out to their contacts. These contacts' extensive knowledge of the relevant content area and their experiences teaching the same or similar courses encouraged faculty participants to communicate with these contacts. For example, F3 said, "She has a lot of directly applicable ideas and experience for some of the classes." Similarly, F5 shared, "There are certain topics which I teach but I am not particularly an expert in. So, I tried asking other professors how they would teach that topic." Interactions with the contacts with subject-matter expertise enhanced their understanding of course content and their access to valuable materials for course development.

Personal and Professional Relationships

We found that personal and professional relationships were another important factor when communicating with their contacts about teaching. The types of personal and professional relationships included (a) mentoring relationships, (b) collegial relationships, (c) friendship, and (d) hierarchical relationships. Many participants (F1, F2, F6, F7, F9, F10, F12, F14) indicated that mentoring relationships with their contacts from their graduate schools or currently affiliated departments were one of the critical reasons they communicated with them about teaching. Several participants explained that their faculty mentoring committees at their institution were their important contacts for teaching enhancement. Their committees also offered advice on tenure and promotion beyond teaching. F10 shared, "I meet with them twice a semester to talk about teaching and different parts of my appointment." Interestingly, some faculty participants worked for their home departments where they earned Ph.D. or master's degrees, and they continued to develop a mentoring relationship with their previous academic advisors, discussing teaching and beyond.

Several participants (F1, F3, F4, F8, F9, F11, F14) communicated with their colleagues, such as co-instructors and course teaching assistants (TAs), about course development and implementation. For example, some participants (F8, F9) communicated with their TAs to gain feedback and learn from students' perspectives on their course assignments and materials. In addition, participants (F2, F3, F4, F8, F13) discussed teaching with their Ph.D. cohorts and friends in the same discipline and sought feedback from them. For example, F13 shared, "She was in my Ph.D. cohort. . . I have sent her my syllabus. We have met over Zoom and chit-chatted about teaching, getting through faculty life, and all of that." The results showed that the trusting relationships that develops over time facilitated their conversation about teaching and beyond. In addition, four faculty participants (F2, F5, F6, F14) mentioned that they communicated with their department chairs about course development because of the hierarchical relationships they had with them. They felt that seeking their department chairs' input was important to ensure that their courses met the needs of the department and its students. In explaining why they spoke to their chair about teaching issues, F5 said:

I think because she is my boss. The department chair is the person who is going to give me my assignments and tell me what courses I have to teach. I think it is based on this kind of hierarchy relationship. I need to consult with her about certain things.

Approachable Personality: Feeling Comfortable and Supportive

Another reason for communicating with their contacts was their approachable personalities. Several participants (F6, F7, F8, F10, F11, F13) mentioned that they spoke with their contacts because they felt comfortable and supported when discussing their concerns about teaching or asking for feedback. For example, F8 said, “I am comfortable showing my insecurities. . . I am comfortable sharing that with them.” Along the same lines, another faculty member (F7) shared:

There are so many stupid questions that you have when you are just starting out teaching. . . You just do not know who to ask because you are going to get embarrassed, or I get embarrassed anyway. So, I would ask her, and I knew she would not judge me.

Objective 4. Identify Topics That Faculty Members Discussed With Their Teaching-Focused Contacts

During the qualitative phase, faculty participants were asked about topics they discussed with their teaching-focused contacts. We found that they talked with their contacts about various topics, including (a) advice on and feedback about teaching, (b) information and resources about teaching on campus, (c) administrative matters and logistics of teaching, and (d) emotional support.

Advice on and Feedback About Teaching

Several faculty participants (F6, F7, F8, F10, F12, F13) mentioned that they asked for advice and feedback about teaching from their contacts regarding course design, course materials, and in-class and online activities. For example, F12 said, “She is somebody that I will call to say, Hey, I am trying to think of a way to do this. Here is what I think I am going to do. . . What do you think?” Another faculty (F7) shared one specific example of advice they took from their contact: working with industry where their students can go for internships and employment. Based on the advice from one of their contacts, F7 developed relationships with people in industry, yielding various positive outcomes for their courses and students: “With all of those relationships, I started working with industry people; internships are coming for my students, and jobs are coming for my students.” (F7). The results showed that feedback and advice from their contacts offered faculty participants new perspectives and insights about their teaching, which consequently improved their teaching and benefited their students’ learning and employment.

Information and Resources About Teaching

Participants (F2, F8) mentioned that they talked with their teaching-focused contacts about teaching information and resources on campus, such as faculty instructional support centers, faculty learning communities, and instructional development programs. For example, F8, a relatively new faculty member, stated, “As I have been new, I have relied on him quite a bit to kind of figure out the resources.” Similarly, F2 said:

I think a lot of the content that comes up in these discussions are about the resources on campus. . . They have mostly given me advice on like seeking out the [faculty teaching support center] and attending this webinar or looking into a new faculty learning community that might be interesting to you.

Administrative Issues Related to Teaching

Several participants (F5, F10, F13, F14) mentioned they talked with their teaching-focused contacts about administrative issues related to teaching, such as developing a certificate program and searching for funding for course development. These contacts mainly included department chairs, college deans, and senior faculty members with an administrative role in their departments or colleges. For instance, F5 stated, "I have contacted them for administrative things like I do not know where certain funds that I have access to that I can use for the course are." Similarly, F10 shared, "If I have any questions that are administrative or anything that would be related to those topics, I definitely reach out to that person."

Emotional Support

Faculty participants (F2, F7, F13) also mentioned that their teaching-focused contacts offered them emotional support along with instructional advice or feedback. These types of contacts mainly included their friends and Ph.D. cohort, who had a close relationship with them, as well as the faculty cohort, who were at a similar career stage and facing similar challenges as a new faculty member. For instance, F7 shared, "She and I started at the same time. . . So, kind of the aches and pains of being new faculty, she and I can rely on each other." Along the same line, another faculty member (F2) mentioned, "She and I both started our faculty positions at about the same time. So, we commiserate and vent to each other when we feel frustrated."

Conclusions, Implications, and Recommendations

Using a mixed-methods egocentric network approach, this study focused on identifying characteristics of faculty members' teaching-focused personal networks, why they communicated, and what topics they discussed with their teaching-focused contacts. First, egocentric network analysis offered insights regarding university faculty members' teaching-focused networks by identifying the compositional and structural characteristics of their networks. Further, the qualitative study extended the quantitative results by describing information, resources, and expertise accessed through ties in faculty members' personal networks and identifying factors associated with the presence of ties between faculty members and their contacts.

The results indicated that faculty participants typically communicated with a few individuals, which was aligned with the previous research (Rienties & Hosein, 2015; Roxå & Mårtensson, 2009). However, social network literature (Lin, 2001; Van Waes et al., 2018) has indicated that greater network sizes are often related to increased access to information and resources. Interactions with a few people could lead to a lack of information and resources, which can consequently cause a lack of instructor development (Thomas et al., 2019). To expand faculty members' teaching-focused networks, university administrators are encouraged to provide their faculty members with opportunities to engage in various college- and institutional-level instructional development programs (Hur et al., 2022) and/or teaching enhancement opportunities.

Regarding the compositional characteristics of faculty participants' teaching-focused networks, while faculty participants discussed their teaching with various types of contacts within and outside their institutions, they mainly communicated with their departmental colleagues and individuals in the same discipline, which was aligned with previous research (Pataraiia, Margaryan, et al., 2014; Rienties & Kinchin, 2014). One possible explanation of these consistent results is that their departmental colleagues or individuals in the same discipline are more familiar with the departmental and discipline teaching context and students in their department (Pataraiia, Falconer, et al., 2014; Rienties & Kinchin, 2014). Communication with homophilous individuals offers comfort and belongingness and encourages greater ease of communication (Perry et al., 2018;

Rogers, 2003). However, a homophilous network can limit faculty members' opportunities to explore new ideas and perspectives (Pataraiia, Margaryan, et al., 2014). Thus, it is recommended that faculty members make efforts to develop diverse or heterophilous networks to obtain innovative perspectives about teaching practices.

We also found that faculty participants tended to communicate with their strong ties regarding teaching, which was consistent with the previous research (Pataraiia, Margaryan, et al., 2014; Pataraiia, Falconer, et al., 2014). Although strong ties facilitate a more efficient exchange of complex information, strong ties are typically similar to ego (faculty members), so they are not necessarily valuable resources for acquiring new perspectives (Perry et al., 2018) and could hinder access to new information (Granovetter, 1973). This finding would imply that faculty development specialists need to facilitate faculty members' awareness of the value of weak ties, which are typically heterophilous. Based on Granovetter's (1973) theory of the strength of weak ties, such heterophilous connections would help faculty members access new and nonredundant information about teaching, such as innovative teaching approaches and curriculum design.

Concerning the heterogeneity (alter-alter difference) of participants' personal networks, the results indicated that the faculty members' contacts (alters) mainly had the same characteristics regarding their affiliation, position, sex, and race. Given that heterogeneous connections would offer faculty members opportunities to access knowledge and support for conducting new teaching practices (Pataraiia, Margaryan, et al., 2014), university leaders are encouraged to provide their faculty members with the opportunities, venue, and time for interactions and exchanges of teaching knowledge and strategies with various faculty members across departments and institutions (Pataraiia, Margaryan, et al., 2014).

In terms of the structural characteristics of faculty members' teaching-focused networks, the average density of respondents' networks indicated that approximately one-third of contacts knew each other. In this densely connected network, most members of the network know each other considerably well. When everyone knows one another, people tend to have a similar perspective (Perry et al., 2018). Thus, such densely connected networks are less likely to expose new ideas created elsewhere (Pataraiia, Falconer, et al., 2014). On the other hand, the social network literature (Burt, 2000) indicates that a network with low density relates to less redundant information in a network and more significant novelties. In the context of this study, the more a faculty's contacts are unrelated to each other, the more their contacts are likely to offer the faculty new insight regarding teaching. Thus, faculty members are encouraged to create more loosely connected networks by connecting with different social groups (Granovetter, 1973; Perry et al., 2018) to access new information about teaching.

With respect to rationales for communicating with their contacts, the findings suggested that expertise in teaching and subject matter were key considerations when reaching out to someone for teaching advice and feedback, which was aligned with previous studies (Pataraiia, Margaryan, et al., 2014; Spillane et al., 2015). The implication of this finding would be to support faculty members in being aware of the location of expertise within their institutions and beyond. In other words, university leaders are encouraged to help faculty members know who has expertise in teaching and subject matters so faculty members can address their challenges and receive the appropriate support they need. For example, it would be helpful to offer faculty members a list of contact information of teaching and content experts within and outside their institution. This resource would help faculty members connect with appropriate experts who can support their teaching and improve their course quality.

Additionally, the results showed that faculty members had other rationales for seeking out their contacts for teaching, including personal and professional relationships and approachable personalities (i.e., feeling comfortable and supported). Regarding personal and professional relationships, mentoring relationships were one of the prominent reasons for interaction with their contacts about teaching. Given the substantial benefits of mentoring on teaching and beyond (e.g., career satisfaction, scholarly productivity, and promotion and tenure) (Johnson, 2015), university administrators are encouraged to create a mentoring culture, especially for new faculty members, by implementing formal mentoring programs. In particular, Johnson (2015) suggested using a team or cohort mentoring program consisting of several new faculty members and one or more senior mentors. Such a cohort mentoring model would allow new faculty members access to senior faculty mentors' expertise and information as well as peer faculty members' support (Johnson, 2015).

Further, the qualitative results revealed that faculty members communicated with their teaching-focused contacts about various teaching topics, including (a) advice and feedback about teaching (i.e., course design and validity of course activities, materials, and student assignments), (b) information and resources about teaching, (c) administrative issues related to teaching, and (d) emotional support. The results were congruent with previous studies (Pataraiia, Margaryan, et al., 2014; Roxå & Mårtensson, 2009; Rienties & Hosein, 2015), which found faculty members acquired professional support through interactions with their colleagues and received emotional support when they faced challenges. In particular, faculty participants' close and trusted colleagues and friends offered them both instructional advice and feedback and emotional support, which was consistent with previous research (Pataraiia, Margaryan, et al., 2014; Rienties & Hosein, 2015). Faculty participants mentioned that these close and trusted individuals knew them well and were at a similar career stage, so they were comfortable sharing their challenges and frustrations regarding teaching and beyond. The findings showed that faculty participants' teaching-focused contacts provided various information, resources, and expertise about teaching and beyond that significantly benefited their professional development.

While this current study contributes to the literature about university faculty members' teaching-focused personal networks, the generalizability of the findings is limited because the sample was restricted to faculty members who participated in an instructional development program at one research-intensive university. The faculty participants' characteristics may not fully represent university faculty members in a broader range of contexts and settings. We recommend that researchers at other agriculture universities replicate this study with a larger, randomized sample to increase the generalizability of the findings. Additionally, they can compare their results to ours to identify any similarities or differences.

In addition, this study investigated faculty members' teaching-focused personal networks in a descriptive and cross-sectional way. Considering that personal and professional relationships change over time, it would be valuable to explore how faculty members' network characteristics change and identify factors that influence their network structure (Pataraiia, Falconer, et al., 2014). Research using longitudinal data on faculty teaching-focused networks could help us better understand how and why faculty members' teaching-focused personal networks evolve over time.

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