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Relationships Among DNP and PhD Students After Implementing a Doctoral Student Organization

Jasmine L. Travers, Marjorie Weis, and Jacqueline A. Merrill

Abstract

BACKGROUND Early career contact, between clinically focused DNP and research-focused PhD nursing students, may encourage desirable intradisciplinary synergies.

AIM The aim of the study was to assess relationships among DNP and PhD nursing students after initiating a doctoral student organization.

METHOD An online survey assessed student interaction pre- and post-doctoral student organization implementation. Analysis consisted of paired *t*-test, social network analysis, and content analysis methods.

RESULTS Response rates were 72 percent ($n = 86$) and 60 percent ($n = 72$) before and after implementation. Network density and centralization increased by 17 percent and 3 percent, respectively; intradisciplinary ties increased by 39 percent. The average student had approximately two new relationships; clique membership increased by 60 percent. Narrative responses corroborated network measurements.

CONCLUSION We documented additional integration and organized communication among students after this strategy to increase collaboration. Educators preparing nurses to work across research and practice may consider network analysis methods to evaluate their efforts.

KEY WORDS Collaboration – Intradisciplinary – Graduate Nursing Education – Social Network Analysis

Doctorally prepared nurses are well positioned to lead change in today's health care environment and are expected to do so because of their advanced training, education, and practice experience (Institute of Medicine [IOM], 2011). Partnerships between nurses with a doctor of nursing practice degree (DNP), a clinical practice doctorate, and nurses with a doctor of philosophy degree (PhD), a research doctorate, are important for identifying critical clinical questions necessitating research. These research questions may subsequently be translated into knowledge for practice (Edwardson, 2010). The 2003 IOM report, *Who Will Keep the Public Healthy,* further encourages collaboration between researchers and clinical practitioners to promote public health.

Together, DNPs and PhDs combine skills such as clinical, organizational, economic, scholarship, quality improvement, and leadership (Cronenwett et al., 2011). Nurses with a DNP degree are practice experts prepared to raise questions of clinical importance, identify the best available evidence, and translate subsequent evidence into practice. Those with a PhD are prepared to develop a program of research that is knowledge driven and answers clinically relevant questions (Cronenwett et al., 2011). However, capitalizing on the potential for unique contributions from these two groups of doctorally prepared professionals can be quite challenging. Professional silos, which present serious barriers to collaboration, typically emerge once individuals become immersed in professional pursuits and are affected by time restraints, lack of interest, and limited understanding of the benefits of collaboration between disciplines.

Silos have been described as traps, and a person can be siloed inside an entity such as a specialist department, social group, team, or pocket of knowledge (Tett, 2015). When professionals are siloed, they tend to work closely together internally but have limited interaction with other professionals, who may also be siloed. In health care, silos are considered barriers to collaboration and effective knowledge sharing and even patient safety (Kreindler, Dowd, Dana Star, & Gottschalk, 2012; Weller, Boyd, & Cumin, 2014). Furthermore, silos are associated with poor communication and duplication of effort and waste, all of which can make health care less efficient, effective, and safe (Merrill, Keeling, & Carley, 2010). The phenomenon has been

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credited with contributing to suboptimal patient experiences and health outcomes (Kilo, 1998; Newhouse & Spring, 2010).

Alternatively, collaboration between health professionals has been shown to improve communication, efficiency, and effectiveness in caregiving (Murphy, Staffileno, & Carlson, 2015; Rafferty, Ball, & Aiken, 2001) and occurs when the various components in a system depend on and interact with each other. It is a crucial factor in collaborative team care and a means to address the complexities in health care that cannot be fixed by one discipline alone (Larson, Cohen, Gebbie, Clock, & Saiman, 2011). It is also an important strategy for meeting the triple aim of health reform: better care, better population health, and lower health care costs (Berwick, Nolan, & Whittington, 2008). Collaborations between DNP- and PhD-prepared nurses have been underscored to span the continuum of translational research and reduce the research-to-practice gap (Buchholz, Yingling, Jones, & Tenfelde, 2015; Vincent, Johnson, Velasquez, & Rigney, 2010).

Redesigning health education to provide opportunities for mutual learning and team development is a recommended strategy for improving collaborative dependence between clinical and research professionals (Buchholz et al., 2015; Edwards, Rayman, Diffenderfer, & Stidham, 2016; Frenk et al., 2010). Student organizations are one educational redesign mechanism for building collaboration, open communication, and idea generation (Veronesi & Gunderman, 2012). Moreover, student organizations have potential for building intraprofessional collaborations among nurses preparing for practice and research doctorates early in their careers. These organizations can facilitate partnerships among students, faculty, and administration, as well as local communities and regional and national groups (Veronesi & Gunderman, 2012). Networking, personal and professional development, and enhancing the lives of others are naturally occurring byproducts of organization participation (Mata, Latham, & Ransome, 2010). Therefore, student organizations present a means to bridge the interests of students engaged in both practice and research predoctoral study. The long-term aim of fostering connections between students is to lay the foundation for future collaboration that has potential to optimize health care delivery and outcomes.

In fall 2014, a new social structure, a doctoral student organization (DSO), was initiated by two students: one in the DNP program (MW) and the other in the PhD program (JT) at Columbia University School of Nursing, a research-intensive academic school of nursing (SON). The immediate goal of the DSO was to foster collaborations among doctoral students who may have previously been siloed within their respective programs (DNP and PhD). A larger goal was to foster relationships that would prepare these nurses to become full partners with professionals in the health care field (IOM, 2011). From the development of such relationships and partnerships, we should expect to see improved health care delivery and patient outcomes. In this article, we report on implementation of the DSO and evaluate its influence on collaboration among DNP and PhD nursing students. We demonstrate how social network analysis, a quantitative method for calculating relationships, may be used to evaluate efforts aimed at improving collaboration.

METHOD

Design

To evaluate the success of the DSO in fostering collaboration, we conducted an observational cohort study of DNP and PhD students. In planning the evaluation, we recognized that the extent to which a new behavior, such as collaboration, spreads throughout a group depends not only on its relative appropriateness and value but also on the underlying social structure. Therefore, we applied social network analysis methods to measure collaborative relationships at two time points: before and after implementation of the DSO (presurvey/postsurvey). Social network analysis is ideal for this type of evaluation because it is able to quantify the relationships among groups or networks. The institutional review board (IRB) at Columbia University Medical Center approved this study.

Social Network Analysis

Social network analysis is a method used to quantitatively describe the quality and quantity of relationships in a network (Knoke & Yang, 2008). A network is a set of nodes that are connected by ties or links. Nodes typically represent people, such as doctoral nursing students, and the ties between them represent some type of relationship, such as collaboration (Knoke & Yang, 2008). As individuals may enter and leave a group over time, social networks are constantly changing. Mathematical equations derived from graph algebra can be used to quantify the ties shared between nodes and to measure properties of the entire network.

Sample and Setting

Our cohort was defined as any student registered in the DNP and PhD programs during the fall 2014 and spring 2015 semesters. All eligible students were invited to participate. Faculty were not included in the survey.

At the time of the study, students entered the DNP program via two paths: *seamless* and *lateral*. Seamless students entered with a nonnursing undergraduate degree, obtained a bachelors of science in nursing, and enrolled in masters of science coursework concurrent with DNP coursework. This program took three to five years to complete. Lateral students entered the DNP program with a BS or MS in nursing and completed their program in approximately two to three years. All DNP students typically had four semesters of on-campus didactic coursework requirements all day on Fridays. Other DNP coursework requirements included a clinical field experience and online courses that did not require students to be physically on campus. The final two semesters of the DNP program consisted of the residency phase; although there was no requirement for DNP candidates to be physically on campus, some chose to travel to campus to meet with their advisor or sponsor.

PhD students entered the program with an undergraduate or master's degree in nursing. They finished in three to five years by completing four semesters of coursework followed by a dissertation phase. While completing coursework, students typically had on-campus requirements from two to five days a week, depending on the semester and electives. On-campus requirements for PhDs during their dissertation phase were reduced to the frequency and mode of meetings with their advisor as well as data collection and analysis needs.

In 2014, first-year DNP and PhD students ($n = 28$ and $n = 5$, respectively) were required to take an evidence-based research course that took place on Fridays. Because DNP students were most commonly on campus on Fridays and a handful of PhD students had classes on that day as well and/or were able to make it to campus, this was the day decided upon to hold the majority of DSO events.

Survey Instrument

We modified an existing survey developed to examine collaborative relationships among interdisciplinary researchers and among nursing

students and faculty (Aboelela, Merrill, Carley, & Larson, 2007). After completing a brief set of demographic questions (e.g., program, gender, ethnicity), respondents were asked to categorize their relationship with each student within a list of all doctoral students, in terms of one of five possible degrees (described in more detail in Supplemental Digital Content 1, available at http://links.lww.com/NEP/A67): *worked with* (you have worked with this person on a project, publication, or other academic/professional/clinical collaboration or connected with this person socially), *met* (you have met this person and are familiar with academic/professional/clinical work), *know work* (you are familiar with this person's academic/professional/clinical work), *heard of* (you have heard of this person and may have met casually, but you do not know academic/professional/clinical work), and *don't know* (you have not heard of this person). For the analysis, only the responses "met" and "worked with" were considered indicators of collaboration.

Questions were added to assess preferred study locations and perceptions regarding communication between doctoral students (e.g., on a scale of 1–10, how satisfied are you with communication: between yourself and PhD students; between yourself and DNP students?). Scores ranged from 1 (*very unsatisfied*) to 10 (*very satisfied*) with 5 indicating neutral. An open text box was provided for respondents to include general feedback on the survey itself.

To ensure that network questions were clear, comprehensible, and not burdensome, we piloted the survey with a doctoral student. As social network analysis is a method for analyzing relationships and, by definition, relational data measured in the survey are dependent observations, network measurement does not lend itself to reliability and validity testing as done in conventional survey development. Establishing true network validity would involve the impracticable step of observing every real-world interaction; however, questions must be crafted to address the precise relationship intended, and results must resonate with real circumstances (i.e., face validity).

DSO Intervention

The formal mission of the DSO was to "provide a forum for DNP and PhD students to communicate, support, and advocate for one another in a manner that meets the unique needs of the doctoral student body and enhances the pre-doctoral experience." The DSO had the additional goal of providing doctoral students with a social environment so that they may share experiences, advance ideas, and build relationships.

PLANNING The doctoral student organizers took several steps to optimize the organization's success. a) They convened two working groups to identify students' wants and needs from the organization and recruited a doctoral student planning committee that met monthly to discuss logistics. b) They contacted representatives from nursing schools with existing DSOs about the structure and purpose of their organizations and to identify barriers, facilitators, and lessons learned. c) They prepared a proposal, applied for recognition of the organization at the SON, and met with deans, faculty, staff, and alumni to gain support for this new endeavor. d) Two faculty advisors for the organization were identified, one from the DNP program and the other from the PhD program. e) DSO activities and events were supported by the Office of Student Activities with monetary support and flyers to promote attendance. A kick-off meet-and-greet session was held for all doctoral students in November 2014 to introduce the purpose of the organization and inform students of upcoming events.

EVENTS DSO activities formally started in January 2015 with a meet-and-greet session. The executive director of the New York State Nurse Practitioner Association gave a keynote address on the importance of collaboration among DNPs and PhDs. This event was followed by a town hall meeting for all DNP and PhD students, a culture and faith exposition open to the entire university community, and a DSO social hour. Refreshments were provided at all events.

Service to the local and global community was another important initiative of the DSO. Members participated as medical volunteers for the New York City Marathon, assisted in wrapping gifts for the homeless, and planned a food drive service project to support a local pantry. The DSO also organized an Ebola relief initiative to provide medical supply gloves to affected West African countries through the sale of custom-made winter gloves. This initiative, Gloves4Gloves, consisted of coordinating schedules among students to promote and sell gloves, ship online orders, and seek agencies that would support the delivery of medical supply gloves to West Africa.

FUNDING To obtain financial support for DSO activities, members successfully wrote two small grants and corresponded with various offices at the SON. A GoFundMe fundraiser was launched to support the Ebola relief initiative. A LinkedIn group was created to facilitate networking opportunities, and a Facebook group was created to promote communication and share photos and event information. Information related to the DSO was also communicated to students through an email list serve along with emails from the DSO faculty advisors and Office of Student Activities. (A timeline of these events is presented in Supplemental Digital Content 2, available at http://links.lww.com/NEP/A68.)

Data Collection and Analysis

In October 2014, the DSO faculty advisors and the school's student activities coordinator sent an email to all enrolled DNP and PhD students that explained the DSO evaluation study and participation by completing the online survey. Reminders were sent at regular two-week intervals to increase participation (Dillman, 2011). Recruitment for the presurvey started in October and ended in December 2014; for the postsurvey, recruitment started in April and ended in June 2015.

In a paragraph at the start of the survey, students were provided with a description of the study, including potential risks. They were informed that the choice to participate was voluntary, that the decision to participate or not would have no effect on their academic standing, and that completion of the survey served as informed consent.

The investigators used ORA network analysis software to input and analyze relationship data (described below). Stata statistical software version 13 was used to analyze nonnetwork data. Chi-square was used to analyze descriptive data, and paired sample *t*-tests were used to analyze mean scores for "satisfaction with communication" questions. Appropriate assumptions for performing paired sample *t*-tests were checked; results were considered significant at a p value of $<.05$ for all analyses.

NETWORK ANALYSIS The data were formatted as a symmetrical matrix with students (nodes) represented on the axes and the relational ties between students represented in the cells. Each student node had a set of attributes derived from the demographic questions in the survey. The attributes allowed us to examine subgroups in the network. An additional attribute was added to identify whether or not a student participated in a DSO event, using sign-in sheets from each event.

Network-level measurements were calculated to describe the quality and quantity of relationships among students. Measures included

density (how many relationships are present compared to how many could be), *transitivity* (proportion of pairs where student A has a relationship with student B and student B has a relationship with student C and student C also has a relationship with student A), *centralization* (how much relationships revolve around a small group), and *diffusion* (how quickly information can spread). Node-level measurements included clique count (the average number of small connected groups) and effective network size (average number in each student's personal network). (We have defined these measures more completely and interpreted them in the context of this study in Supplemental Digital Content 3, available at http://links.lww.com/NEP/A69.)

To ensure the robustness of our results, we reconstructed ties through sensitivity analyses, such that if student A indicated a relationship with student B, a reciprocal link between student B and student A was assumed (Neal, 2008). Analyzing the data in this manner accounted for missing responses during both surveys.

QUALITATIVE ASSESSMENT The survey included an open text field to allow students to enter feedback concerning the study. Comments were analyzed using content analysis, an approach that allows for themes to emerge directly from the text (Hsieh & Shannon, 2005). Two researchers (JT and MW) initially examined the text comments to identify similar and/or recurring words and phrases. To minimize bias, the researchers bracketed their viewpoints and assumptions regarding collaboration. After individually coding the data, the researchers met to resolve discrepancies and reach consensus on a set of themes. To further ensure the trustworthiness of the data, the faculty research advisor (JM), not involved with the intervention, analyzed data in their entirety. Another meeting was held to ensure consensus, and themes were finalized.

RESULTS

Descriptive Analysis

Eighty-six doctoral nursing students (72 percent) responded to the presurvey; 72 of 120 possible participants (60 percent) responded to the postsurvey. We programmed the survey software to not allow skipped questions; however, participants were permitted to skip the last question related to satisfaction with DNP and PhD students. Missing data for this question was $< 6\%$. At baseline, the majority of participants were white (51 percent), followed by Asian (17 percent) and black (9 percent); approximately 14 percent of participants identified as Hispanic.

At the time of the presurvey, PhDs were more likely to have a master's degree ($p = .001$) and be 40 years and older compared to DNPs ($p = .004$). More than half of respondents (56 percent) had participated in a DSO event (DNPs, 48 percent; PhDs, 80 percent, $p = .014$). Forty-four percent of baseline participants had taken courses with doctoral students from the opposite program. On average, 85 percent preferred studying outside of the nursing building, but this was more pronounced among DNPs than PhDs (97 percent vs. 50 percent). At the time of the postsurvey, fewer DNPs reported preference for studying outside of the nursing building (88 percent). (Demographic characteristics and survey response rates pre- and post-DSO implementation are presented in Table 1.)

Satisfaction

Overall, participants reported an increase in satisfaction with communication over time (Table 2). Prior to DSO implementation, participants rated their satisfaction with communication between themselves and other DNP students with a score of 4.83 (below neutral). After DSO implementation, average satisfaction with communication between the participant and DNP students increased to a score of 5.94 (above neutral). A similar mean score increased for PhD students (4.81 pre to 5.96 post). From our paired sample *t*-test analysis, we were able to conclude that these changes were statistically significant ($p = .016$ and $p = .020$, respectively).

Social Network Analysis

At the network level, centralization increased by 3 percent; density increased by 17 percent. Within groups, the density of ties increased by 27 percent among DNPs and by 12 percent among PhDs. Between the two groups, the density of ties increased by 30 percent; diffusion decreased by 15 percent. The number of links from PhD to DNP students and from DNP to PhD students both increased by 39 percent. Transitivity increased by 15 percent.

At the individual node level, on average, the number of cliques per student increased by 62 percent, and the effective network size for a student, on average, increased by 18 percent. These results are shown in Table 3. Our sensitivity analysis results showed similar increases across the network and individual-level measurements with the exception of diffusion, which increased when the network was reconstructed as opposed to the original decrease (see Supplemental Digital Content 4, available at http://links.lww.com/NEP/A70).

Qualitative Analysis

To contextualize our findings, we analyzed respondent comments. Seventeen students responded to the open-text question at each time point (19.8 percent and 23.6 percent, respectively). Two themes, "value in connecting with other disciplines" and "improving mechanisms to associate with other students," emerged at both time points. An additional theme, "value in connecting with one's respective discipline," emerged in the presurvey. An additional theme, "concerns related to survey," emerged in the postsurvey.

VALUE IN CONNECTING WITH OTHER DISCIPLINES Ten comments addressed this theme. Respondents emphasized the value of opportunities for DNP and PhD students to collaborate. A PhD student noted this to be the reason for choosing the particular doctoral program, explaining, "[I] look forward to more classes/projects with DNP's…I love to see practice and get critique from a different… non-homogenous perspective." Another student characterized absent relationships between DNP and PhD students as a "missed opportunity," adding: "We should be modeling the way to optimize opportunities for creating system changes in health care. If silos are a norm within the academic learning environment, we're sending the wrong message to the next generation of leaders."

IMPROVING MECHANISMS TO ASSOCIATE WITH OTHER STUDENTS Nine comments addressed this theme. Respondents noted that there were a few ways for students to connect efficiently, both with those in the opposite doctoral program and within their own cohort. One student suggested a "DNP/PhD student group or online forum where students from all cohorts could communicate with one another via [a] social networking site." Another student offered that students should not be the only stakeholders attempting to forge these connections: "An opportunity to change the academic environment and culture exists, but this requires administrative leaders and faculty coming together to purposefully change curriculum for PhD[s] and DNP[s] to have shared learning experiences."

VALUE IN CONNECTING WITH ONE'S RESPECTIVE DISCIPLINE Three comments addressed this theme. DNPs in particular discussed the

Table 1: Pre- and Postsurvey Demographic Descriptives of Doctoral Nursing Students, *n* (%)

Characteristic	Pre			Post		
	Total (*n* = 86) *n* (%)	DNP (*n* = 64) *n* (%)	PhD (*n* = 22) *n* (%)	Total (*n* = 72) *n* (%)	DNP (*n* = 52) *n* (%)	PhD (*n* = 20) *n* (%)
Highest level education*						
BSN	32 (37)	31 (48)	1 (5)	19 (26)	17 (33)	2 (10)
MSN	34 (40)	21 (33)	13 (59)	35 (49)	24 (46)	11 (55)
DNP	2 (2)	2 (3)	0	2 (3)	2 (4)	0
PhD	2 (2)	2 (9)	0	1 (1)	0	1 (5)
Other bachelor's	3 (3)	3 (5)	0	2 (3)	2 (4)	0
Other master's	13 (15)	7 (11)	6 (27)	12 (17)	6 (12)	6 (30)
Other doctoral	0	0	0	1 (1)	1 (2)	0
1st gen, college student	29 (34)	19 (30)	10 (45)	23 (32)	15 (29)	8 (40)
Race						
Black	8 (9)	5 (8)	3 (14)	4 (6)	2 (4)	2 (10)
White	44 (51)	34 (53)	10 (45)	36 (50)	26 (50)	10 (50)
Asian	15 (17)	12 (19)	3 (14)	14 (19)	10 (19)	4 (20)
Other	5 (6)	4 (6)	1 (5)	4 (6)	4 (8)	0
Do not wish to answer	2 (2)	0	2 (9)	3 (4)	1 (2)	2 (10)
Hispanic ethnicity	12 (14)	9 (14)	3 (14)	11 (15)	9 (17)	2 (10)
Age, years**						
20-29	43 (50)	39 (61)	4 (18)	32 (44)	29 (56)	3 (15)
30-39	27 (31)	17 (27)	10 (45)	26 (36)	15 (29)	11 (55)
40-49	7 (8)	4 (6)	3 (14)	8 (11)	4 (8)	4 (20)
50+	9 (11)	4 (6)	5 (23)	6 (8)	4 (8)	2 (10)
Female	78 (91)	58 (91)	20 (90)	63 (88)	45 (87)	18 (90)
Year considered as doctoral student**						
2009	1 (1)	0	1 (5)	0	0	0
2010	3 (4)	0	3 (14)	3 (4)	0	3 (15)
2011	1 (1)	0	1 (5)	1 (1)	0	1 (5)
2012	5 (6)	0	5 (23)	6 (8)	1 (2)	5 (25)
2013	15 (17)	9 (14)	6 (27)	10 (14)	5 (10)	5 (25)
2014	46 (54)	40 (63)	6 (27)	27 (38)	21 (40)	6 (30)
2015	15 (17)	15 (23)	0	25 (35)	25 (48)	0

(continues)

Table 1: Pre- and Postsurvey Demographic Descriptives of Doctoral Nursing Students, *n* (%), Continued

Characteristic	Pre			Post		
	Total (*n* = 86) *n* (%)	DNP (*n* = 64) *n* (%)	PhD (*n* = 22) *n* (%)	Total (*n* = 72) *n* (%)	DNP (*n* = 52) *n* (%)	PhD (*n* = 20) *n* (%)
Took courses with other doctoral students	38 (44)	30 (47)	8 (36)	37 (51)	27 (52)	10 (50)
Years affiliated with nursing school**						
<2	49 (57)	40 (63)	9 (41)	27 (38)	19 (37)	8 (40)
2-4	29 (34)	22 (34)	7 (32)	33 (46)	28 (54)	5 (25)
4-6	5 (6)	2 (3)	3 (14)	8 (11)	4 (8)	4 (20)
>6	3 (3)	0 (0)	3 (14)	4 (6)	1 (2)	3 (15)
[a]Satisfaction with communication with PhD students***						
Unsatisfied (1-4)	19 (23)	14 (23)	5 (26)	13 (19)	13 (26)	0 (0)
Neutral (5)	40 (49)	30 (48)	10 (53)	30 (43)	28 (56)	2 (10)
Satisfied (6-10)	22 (27)	18 (29)	4 (21)	27 (39)	9 (18)	18 (90)
[a]Satisfaction with communication with DNP students						
Unsatisfied (1-4)	30 (37)	25 (40)	5 (26)	18 (26)	11 (22)	7 (35)
Neutral (5)	31 (38)	22 (35)	9 (47)	25 (36)	18 (36)	7 (35)
Satisfied (6-10)	20 (25)	15 (24)	5 (26)	27 (39)	21 (42)	6 (30)

[a]Responses do not total complete numbers due to missing data.
*$p < .05$ at presurvey only.
**$p < .05$ at both pre- and postsurvey.
***$p < .05$ at postsurvey only.

value in strengthening relationships within one's own academic networks as opposed to across networks. One student noted, "I have the best experience working with projects with similar major critical care advance nurse practitioners like [myself]. I would like to be with critical-care emergency professionals." Another expressed a need for more unity within the DNPs, "if we are to train as DNPs."

CONCERNS RELATED TO SURVEY Four comments addressed this theme. When the postsurvey was administered, students expressed concerns about how the survey was presented. Students were particularly uncomfortable with having their names listed for all respondents to view. One student stated, "I know this is IRB approved but it does seem a bit violating of privacy to include everyone's name on a survey that [is given] out to all doctoral students." Another student took issue with the recruitment email that explained why a high response rate was optimal in network analysis. The student asked, "Isn't it unethical/impractical to make a survey 100 percent completion rate?"

DISCUSSION

In this study of clinical and research doctoral nursing students, we used network analysis methods to measure relationships among DNP and PhD students before and after implementation of a DSO that created a conduit for communication and opportunities for doctoral students to connect. We observed real-world relationships that contribute face validity to our findings. The DSO provided a platform for DNP and PhD students to realize the potential of their newly created collaborations. For instance, a PhD student used the DSO network to reach out to DNP students for help with recruitment of clinicians for dissertation work; a DNP student used the network to connect with a PhD student for assistance in creating a research team; a PhD student served as a resource with tips on research tools for a DNP student whose group then went on to publish a systematic review; and another DNP student was able to connect with job opportunities through a PhD student's network.

Table 2: Paired *t*-Test Analysis of Mean Satisfaction With Communication Scores Pre- and Post-Doctoral Student Organization Implementation

Satisfaction Characteristic	Mean Satisfaction Score	*p*
Satisfaction/ communication with DNPs		.016
Pre	4.83	
Post	5.94	
Satisfaction/ communication with PhDs		.020
Pre	4.81	
Post	5.96	

Note. Satisfaction score: 1-4 = *unsatisfied*, 5 = *neutral*, 6-10 = *satisfied*.

Our results are consistent with an earlier study conducted by researchers in our institution that found interventions aimed to foster communication (joint seminars, workshops, and professional activities) succeeded in increasing collaborations among DNP and PhD students (Merrill et al., 2013). The DSO used similar strategies to foster these relationships with the addition of social media communication, regularly scheduled town hall meetings, and a student-led executive board from which communication was disseminated. After the DSO implementation, we found changes in student relationships that were favorable to collaboration, similar to what we found in the earlier study (Merrill et al., 2013).

When considering the entire network of students, increased density and transitivity suggested that DNP and PhD students became a more unified, cohesive group. The increase in network centralization, although modest, also points to a more organized communication structure, likely stemming from the DSO's student executive board, which coordinated academic, social, and community initiatives. Diffusion decreased, suggesting that students were branching out from their closest ties and engaging in relationships with a broader range of peers. Increased transitivity is consistent with the diffusion effect, suggesting greater capacity for individuals to interact in small groups.

At the individual-node level, the substantial increase in individual membership in cliques mirrors the increased network transitivity, suggesting that more students worked in overlapping groups, another signal for a more cohesive community (Evans, 2010). During the time subsequent to the DSO initiatives, students had added approximately two new people, on average, to their collegial network, which may have been attributed to working on community and global service projects and participating in DSO events. The improved scores on the survey item "satisfaction with communication," coupled with the students' written comments that expressed a desire to work with students from the opposite doctoral program, add additional face validity to these network findings.

This study highlighted some noteworthy facilitators and barriers to building intradisciplinary relationships. These findings illustrate where efforts can be focused to enhance and promote collaborative intradisciplinary relationships and create platforms for DNPs and PhDs to connect and work together throughout their respective curricula. For example, students promoted and valued the opportunity to be able to connect with their DNP or PhD counterpart. This is encouraging, as it can be difficult to secure interest in collaborative efforts across and within disciplines. Students also highlighted the importance of faculty and administrator involvement in supporting these collaborations. Buchholz and colleagues (2015) note that collaboration between DNP practitioners and PhD researchers in the academic setting can lay the foundation for promoting subsequent collaborations among students.

On the other hand, although DSO events were well attended by students (approximately 30 to 40 students at each event), in a few survey comments and person-to-person communications with the researchers, students expressed difficulties in attending events

Table 3: Network Analysis Results Pre- and Postimplementation of a Doctoral Student Organization

	Pre	Post	% Change
Node count	120	120	
Survey responses	86	72	–16
Network level measures			
Centralization, total network	0.31	0.32	+03
Density, total network	0.12	0.14	+17
DNP within-group density	0.11	0.14	+27
PhD within-group density	0.58	0.65	+12
Between-group density	0.10	0.13	+30
Diffusion	0.67	0.57	–15
Link count			
PhD → DNP	123	171	+39
DNP → PhD	111	154	+39
Transitivity	0.46	0.53	+15
Node level measures			
Clique count	37	60	+62
Effective network size	8.8	10.4	+18

because of conflicting academic, professional, and personal schedules and decreased proximity to campus. To add to our findings related to campus access, nearly all DNP students preferred studying outside the SON compared to PhD students. It is likely that PhD students were more inclined to relocate to areas closer to campus upon doctoral study enrollment due to heavier on-campus program requirements compared to DNP students, thus making on-campus study and subsequent involvement more feasible for the former group. In addition, in our institution, PhD students are assigned workspaces whereas DNP students are not, leaving only one group with reliable workspace at the SON. Moreover, DNP students had clinical commitments not necessarily on campus and may have been less inclined to travel to campus solely for the purpose of studying.

These challenges related to scheduling and location are consistent with comments made by leaders of other DSOs that were contacted by the researchers. Moreover, proximity is a powerful generator of social ties, and colocation has been shown to increase the likelihood that individuals will establish a connection (Rivera, Soderstrom, & Uzzi, 2010). Doctoral study is an intense period when students can be less inclined to interact and become involved in school initiatives and instead tend to focus mainly on studies and responsibilities outside of school. When emphasis is placed on fostering relationships within the academic setting (Buchholz et al., 2015; Frenk et al., 2010; IOM, 2011), the results can include improved attitudes, communication, and collaboration between professional groups (McCaffrey et al., 2012).

We propose that scheduling be considered a primary factor when planning opportunities for students to collaborate as well as options to connect to DSO events through online mechanisms. In addition, allocating common space and/or resources to accommodate on-campus study can lead to further opportunities for collaboration between students in practice and research doctoral programs, helping to facilitate communication.

Two unexpected findings emerged from the qualitative findings, both regarding the study protocol, which was approved by our institution's IRB. The first concern about responding can be attributed to wording in a final recruitment reminder email, which explained why high response is needed for reliable network results. Although wording of the reminders emails was IRB-approved, we may have overrelied on the instructions in the online survey that indicated response was voluntary. When researchers employ reminders to improve response rate, we advise always reiterating the voluntary nature of participation.

The second concern about names listed in the survey was a surprise to us. We designed the survey based on research showing that recall is greatly improved when subjects identify their relationships from a list rather than recall (Scott, 2012). We were confident that the list of names was similar to what any student would expect to see in a class roster or printed in a commencement program and were further reassured by the approval from our IRB. Although certainly we respect the students' concerns, we wonder if the very strong emphasis on privacy protections in health care and in society, in general, may have had an influence.

We ask ourselves also if it is possible that the few students who expressed concern may have been unclear on principles for protecting human subjects from harm. If that is the case, such misconceptions have potential to thwart progress in nursing research and calls for more understanding regarding barriers and facilitators to research participation among doctorally prepared nurses and nursing students.

LIMITATIONS

This study has important limitations. Our response rate for the network analysis method was less than favorable. A network is not a sample, and the best reliability is achieved when missing responses are 10 percent or lower (Borgatti, Everett, & Johnson, 2013). Contributors to this low rate may be DNP students primarily taking master's courses who did not self-identify with DNP status as of yet. Another reason may be the concern some students expressed regarding the survey format. However, through our sensitivity analysis, we found that our presented results were similar to what we would have found if the entire network responded. Triangulation in our methods (i.e., network analysis, DSO attendance, paired *t*-test and descriptives, and qualitative data) was also beneficial in countering the low response rate and corroborating our findings.

It is possible that the change in the degree of relationships could be attributed to events other than the DSO intervention, although more than half of respondents attended DSO events. Approximately 25 percent of respondents were enrolled in a new course that combined DNP and PhD students and included group work, which may have added to the degree of relationships. However, the presurvey was administered six weeks into that course, after group assignments were made, making it likely that those new relationships were captured before commencement of the DSO. As with any survey involving self-report, the responses are subject to self-report bias, although our findings are consistent across the multiple methods we used.

CONCLUSION

Doctoral nursing students are not the only stakeholders in the quest for intradisciplinary professional relationships. Administrators, faculty, and staff must acknowledge the significance of intradisciplinary collaboration and support efforts to increase such collaborations (Frenk et al., 2010). When doctoral nursing students are educated in siloed doctoral programs (DNP and PhD nursing students) by siloed doctoral faculty (DNP and PhD professionals), they may perceive this to be the norm, perpetuating the silos among health care professionals that have been shown to jeopardize coordination, integration, and quality of care (Horvitz-Lennon, Kilbourne, & Pincus, 2006).

As health care systems become more complex and fragmented and care needs continue to rise, strong health care teams are critical to meet overwhelming demands (IOM, 2003, 2011). To reinforce "systems-based practice improvement and translational research," both the American Association of Colleges of Nursing and the IOM have called for doubling the number of nurses prepared at the doctoral level (Cronenwett et al., 2011; IOM, 2011). Alongside this increase, viewing the DNP and PhD role as complementary rather than at odds with one another creates opportunities for the two disciplines to collaborate early in their professions using mechanisms such as DSOs (Buchholz et al., 2015). This collaboration is just the first step to realizing the potential impact these two disciplines can make to health care collectively (Edwardson, 2010). Educators aiming to prepare nurses to collaborate across the domain of nursing research and practice may consider network analysis to evaluate the success of their efforts.

REFERENCES

Aboelela, S. W., Merrill, J. A., Carley, K. M., & Larson, E. (2007). Social network analysis to evaluate an interdisciplinary research center. *Journal of Research Administration*, *38*(1), 61-75.

Berwick, D. M., Nolan, T. W., & Whittington, J. (2008). The triple aim: Care, health, and cost. *Health Affairs*, *27*(3), 759-769. doi:10.1377/hlthaff.27.3.759

Borgatti, S. P., Everett, M. G., & Johnson, J. C. (2013). *Analyzing social networks*. Thousand Oaks, CA: SAGE Publications.

Buchholz, S. W., Yingling, C., Jones, K., & Tenfelde, S. (2015). DNP and PhD collaboration: Bringing together practice and research expertise as predegree and postdegree scholars. *Nurse Educator*, *40*(4), 203-206.

Cronenwett, L., Dracup, K., Grey, M., McCauley, L., Meleis, A., & Salmon, M. (2011). The doctor of nursing practice: A national workforce perspective. *Nursing Outlook*, *59*(1), 9-17. doi:10.1016/j.outlook.2010.11.003

Dillman, D. A. (2011). *Mail and Internet surveys: The tailored design method – 2007 Update with new Internet, visual, and mixed-mode guide*. Hoboken, NJ: John Wiley & Sons.

Edwards, J., Rayman, K., Diffenderfer, S., & Stidham, A. (2016). Strategic innovation between PhD and DNP programs: Collaboration, collegiality, and shared resources. *Nursing Outlook*, *64*(4), 312-320.

Edwardson, S. R. (2010). Doctor of philosophy and doctor of nursing practice as complementary degrees. *Journal of Professional Nursing*, *26*(3), 137-140. doi:10.1016/j.profnurs.2009.08.004

Evans, T. S. (2010). Clique graphs and overlapping communities. *Journal of Statistical Mechanics: Theory and Experiment*, *2010*(12). Article ID: P12037. doi:10.1088/1742-5468/2010/12/P12037

Frenk, J., Chen, L., Bhutta, Z. A., Cohen, J., Crisp, N., Evans, T., … Zurayk, H. (2010). Health professionals for a new century: Transforming education to strengthen health systems in an interdependent world. *The Lancet*, *376*(9756), 1923-1958. doi:10.1016/S0140-6736(10)61854-5

Horvitz-Lennon, M., Kilbourne, A. M., & Pincus, H. A. (2006). From silos to bridges: meeting the general health care needs of adults with severe mental illnesses. *Health Affairs*, *25*(3), 659-669.

Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative health research*, *15*(9), 1277-1288. doi:10.1177/1049732305276687

Institute of Medicine. (2003). *Who will keep the public healthy?* Washington, DC: National Academies Press.

Institute of Medicine. (2011). *The future of nursing: Leading change, advancing health*. Washington, DC: National Academies Press.

Kilo, C. M. (1998). A framework for collaborative improvement: Lessons from the Institute for Healthcare Improvement's Breakthrough Series. *Quality Management in Healthcare*, *6*(4), 1-14. doi:10.1097/00019514-199806040-00001

Knoke, D., & Yang, S. (2008). *Social network analysis* (Vol.154). Los Angeles, CA: Sage.

Kreindler, S. A., Dowd, D. A., Dana Star, N., & Gottschalk, T. (2012). Silos and social identity: The social identity approach as a framework for understanding and overcoming divisions in health care. *Milbank Quarterly*, *90*(2), 347-374.

Larson, E. L., Cohen, B., Gebbie, K., Clock, S., & Saiman, L. (2011). Interdisciplinary research training in a school of nursing. *Nursing Outlook*, *59*(1), 29-36. doi:10.1016/j.outlook.2010.11.002

Mata, H., Latham, T. P., & Ransome, Y. (2010). Benefits of professional organization membership and participation in national conferences: Considerations for students and new professionals. *Health Promotion Practice*, *11*(4), 450-453. doi:10.1177/1524839910370427

McCaffrey, R., Hayes, R. M., Cassell, A., Miller-Reyes, S., Donaldson, A., & Ferrell, C. (2012). The effect of an educational programme on attitudes of nurses and medical residents towards the benefits of positive communication and collaboration. *Journal of Advanced Nursing*, *68*(2), 293-301. doi:10.1111/j.1365-2648.2011.05736.x

Merrill, J. A., Keeling, J. W., & Carley, K. M. (2010). A comparative study of 11 local health department organizational networks. *Journal of Public Health Management and Practice*, *16*(6), 564-576. doi:10.1097/PHH.0b013e3181e31cee

Merrill, J. A., Yoon, S., Larson, E., Honig, J., & Reame, N. (2013). Using social network analysis to examine collaborative relationships among PhD and DNP students and faculty in a research-intensive university school of nursing. *Nursing Outlook*, *61*(2), 109-116. doi:10.1016/j.outook.2012.08.001

Murphy, M. P., Staffileno, B. A., & Carlson, E. (2015). Collaboration among DNP- and PhD-prepared nurses: Opportunity to drive positive change. *Journal of Professional Nursing*, *31*(5), 388-394.

Neal, J. W. (2008). "Kracking" the missing data problem: Applying Krackhardt's cognitive social structures to school-based social networks. *Sociology of Education*, *81*(2), 140-162.

Newhouse, R. P., & Spring, B. (2010). Interdisciplinary evidence-based practice: Moving from silos to synergy. *Nursing Outlook*, *58*(6), 309-317. doi:10.1016/j.outlook.2010.09.001

Rafferty, A. M., Ball, J., & Aiken, L. H. (2001). Are teamwork and professional autonomy compatible, and do they result in improved hospital care? *Quality in Health Care*, *10*(Suppl. 2), ii32-ii37. doi:10.1136/qhc.0100032

Rivera, M. T., Soderstrom, S. B., & Uzzi, B. (2010). Dynamics of dyads in social networks: Assortative, relational, and proximity mechanisms. *Annual Review of Sociology*, *36*, 91-115. doi:10.1146/annurev.soc.34.040507.134743

Scott, J. (2012). *Social network analysis*. Thousand Oaks, CA: Sage.

Tett, G. (2015). *The silo effect: The peril of expertise and the promise of breaking down barriers*. New York, NY: Simon and Schuster.

Veronesi, M. C., & Gunderman, R. B. (2012). Perspective: The potential of student organizations for developing leadership: One school's experience. *Academic Medicine*, *87*(2), 226-229.

Vincent, D., Johnson, C., Velasquez, D., & Rigney, T. (2010). DNP-prepared nurses as practitioner-researchers: Closing the gap between research and practice. *American Journal for Nurse Practitioners*, *14*, 28-34.

Weller, J., Boyd, M., & Cumin, D. (2014). Teams, tribes and patient safety: Overcoming barriers to effective teamwork in healthcare. *Postgraduate Medical Journal*, *90*(1061), 149-154.

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