Social Network Analysis of an Agricultural Leadership Program

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Introduction/Need for Research

Social networks can be described as structures consisting of individuals (nodes) and their relationships (ties) (Li, 2013). Cullen-Lester et al. (2017), acknowledge the importance of social networks in a "collective's ability to produce leadership" (p. 146). Therefore, leadership development must address relationships in the targeted group. Van De Valk and Constas (2011) found that leadership development programs (LDPs) frequently suggest that participants may increase their networks through program participation. However, a critical analysis of the limited published research revealed inadequate evidence to support causal inference between change in network and LDP participation. The authors advocated for improved LDP evaluation (Van De Valk & Constas, 2011). Hoppe and Reinelt (2010) called specifically for the use of social network analysis (SNA) to evaluate LDPs. Moreover, Cullen-Lester et al. (2017) identified a dearth of research on the development of collective leadership networks. Therefore, the purpose of this study was to explore the network of an LDP cohort before and after the program.

Conceptual or Theoretical Framework

Social network analysis (SNA) applies a structural approach to studying the interaction among social actors in a network (Freeman, 2004). This approach is "grounded in the intuitive notion that the patterning of social ties in which actors are embedded has important consequences for those actors" (Freeman, 2004, p. 2). The research emphasizes the characteristics of the structure, rather than the individual nodes and ties. There are two fundamental approaches to network analysis, whole-network analysis, and personal or ego network analysis. We utilized whole-network analysis, exploring the ties among all pairs of nodes in the network.

Methodology

We used SNA to investigate network changes of one agriculture and natural resources (ANR) LDP cohort. We sought to characterize the structure of the network by understanding the ties between each set of participants in the cohort. We administered a reflective-pre and post survey to participants via Qualtrics at the conclusion of their LDP. Participants indicated the frequency with which they initiated interaction with each of their classmates in their role as an industry leader on a five-point scale with indicators of never, once or twice a year, once or twice a month, at least weekly, and daily. We exported the data from Qualtrics into Microsoft Excel to be cleaned and recoded. We collected participant demographics, or attributes in SNA, including age, gender, industry sector, and geographic region. We analyzed data in UCINET, calculating whole network statistics. Visualizations were created using NetDraw.

Results/Findings

Participants in the Resource Education & Agricultural Leadership (REAL) Oregon program travel to different locations across the state once per month for five months, developing leadership skills and learning about Oregon's agriculture and natural resources (REAL Oregon, 2021). The program cohort included 23 leaders from five agricultural industries. Nine from production agriculture, three from forestry, two from transportation, seven from agricultural support, and two from education. Twelve participants identified as female and eleven as male, with ages ranging from 28 to 60 years old. Whole-network measures characterized the cohesiveness of the cohort. Number of ties represents the total number of ties between nodes in the network and average degree indicates the mean number of ties each node reported. The

number of ties in proportion to the number of ties possible indicates density, while connectedness is the proportion of pairs of nodes that can reach each other by some path. Finally, the degree of centralization represents the extent to which the network centers around a single node. Pre- and post- program whole network characteristics can be seen in Table 1 and Figure 1.

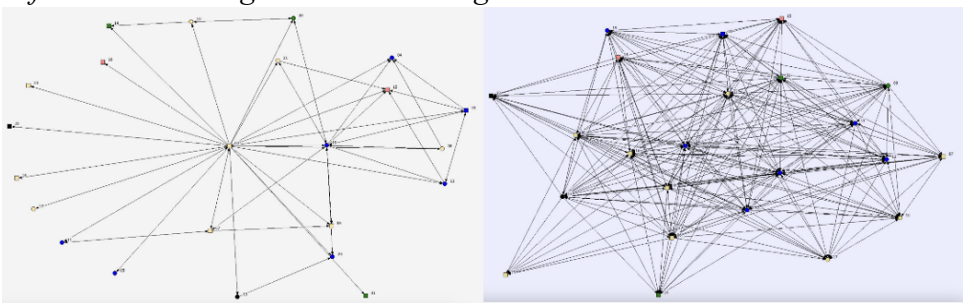
Table 1

Whole Network Measures Pre- vs. Post- Program

Whole Network Measures	Pre-Program	Post-Program
Number of Ties	52	329
Average Degree	2.261	14.304
Density	0.103	0.650
Connectedness	0.439	0.870
Degree of Centralization	0.909	0.190

Figure 1

Reflective-Pre-Program vs. Post-Program Networks



Conclusions

Predictably, cohesiveness of the class increased, indicating that classmates developed new relationships with one another over the course of the program. Moreover, centralization of the network decreased, such that connections were more evenly distributed across pairs of nodes rather than any one participant being a central figure in the network.

Implications/Recommendations/Impact on Profession

ANR LDPs play a crucial role in building collective leadership capacity of the industry (Cullen-Lester et al., 2017). Increased cohesiveness among ANR leaders may support leadership approaches that consider a more holistic view of the industry. Moreover, information and resources can be shared more comprehensively and quickly in a decentralized network, possibly producing more effective systems-thinking approaches to complex problem-solving. We recommend that ANR LDPs emphasize the value and importance of network development to program participants. Additional research should seek to establish causal inference between network change and program participation. Furthermore, this study should be replicated with additional classes in other programs. Finally, qualitative inquiry may uncover meaningful insight into the nature and usefulness of relationships developed through ANR LDPs.

References

Cullen-Lester, K. L., Maupin, C. K., & Carter, D. R. (2017) Incorporating social networks into leadership development: A conceptual model and evaluation of research and practice. *The Leadership Quarterly, 28*(1), 130-152. https://doi.org/10.1016/j.leaqua.2016.10.005

Freeman, L. C. (2004). *The development of social network analysis: A study in the sociology of science*. Empirical Press.

Hoppe, B. & Reinelt, C. (2010). Social network analysis and the evaluation of leadership networks. *The Leadership Quarterly, 21*(4), https://doi.org/10.1016/j.leaqua.2010.06.004

Li, M. (2013). Social network and social capital in leadership and management research: A review of causal methods. *The Leadership Quarterly, 24*(5), 638-665. https://doi.org/10.1016/j.leaqua.2013.04.005

REAL Oregon. (2021). *Resource Education & Agricultural Leadership Oregon.* Retrieved October 9, 2022, from realoregon.net

Van De Valk, L. J. & Constas, M. A. (2011). A methodological review of research on leadership development and social capital: Is there a cause and effect relationship? *Adult Education Quarterly 61*(1), 73-90. https://doi.org/10.1177/0741713610380443