Social Network Analysis of an Agricultural Leadership Program

Laura L. Greenhaw
Department of Agricultural Education and Communication
University of Florida

Matthew Gold
Department of Agricultural Education and Communication
University of Florida

PO Box 110540
Gainesville, FL 32611-0540
352-294-6766
laura.greenhaw@ufl.edu

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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 emphasis of the research is on 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. This research utilized whole-network analysis, which explored 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. Specifically, 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 at both the beginning and end of the program. We used 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. Participant demographics, or attributes in SNA, were also collected including age, gender, industry sector, and geographic region. Data was imported into UCINET for analysis, and whole network statistics were calculated. Data was then visualized 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 consisted of 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. We calculated whole-network measures to characterize 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 the density of the network, while connectedness is the proportion of pairs of nodes that can reach each other by some path, no matter how long. 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.

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 Network

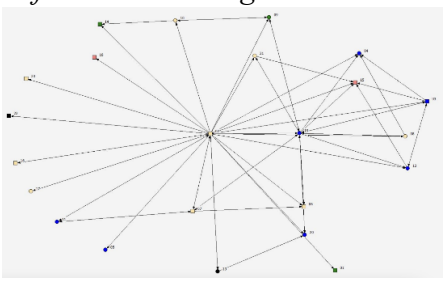
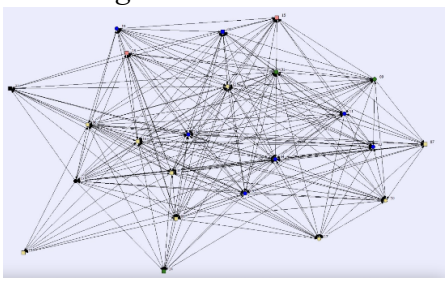


Figure 2
Post Program Network



Conclusions

We identified changes in the whole network of the program cohort from the beginning of the program to the end. 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

ANR LDPs aim, in part, to expand the leadership capacity of the industry by developing collective leadership among cohorts of leaders. Our research suggests that LDP cohort networks can increase in cohesiveness over the course of the program. Increased cohesiveness among ANR leaders may lead to 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. We recommend that ANR LDPs continue developing leaders and the leadership capacity of the industry. 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, a qualitative inquiry may uncover meaningful insight into the nature of relationships developed through ANR LDPs.

References

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