

Identifying Learning Leaders in Collaborative Learning

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Abstract: This study applies social network analysis to identify learning leaders in online collaborative learning. We used indegree, outdegree, and betweenness to categorize learners by their learner participation roles. Three learner roles (full facilitator, transactional facilitator, and attractive facilitator) fit the theories of learning leadership and were effective in identifying learning leaders. The findings pave the foundation for further research developing real-time instrument for instructors to identify learning leaders, and provide timely learning support.

Introduction

The purpose of this paper is to explore a computational approach to identifying learning leaders in online collaborative learning. Specifically, we used three network metrics—degree, outdegree, and betweenness—generated from social network analysis (SNA) to examine social dynamics in online discussions and thus identify learning leaders. Given the social nature of learning leadership, learners' social interactions can be tracked in online learning systems. The data on social interactions can thus enable us to identify learning leaders. However, the literature on leadership and online learning has been mostly running in parallel with little overlap. In this study, we first integrate the literature on leadership and online learning, and then applies social network analysis to develop and compare two leadership classification models to identify learner leaders. Specifically, we ask two research questions:

- How do we use social network metrics to characterize different learner roles in online discussion?
- How do we identify learning leaders from the learner participation model?

Prior literature has proposed a computational approach to classify different learner roles in online learning by using three social network analysis metrics in combination: (1) degree—the number of messages sent by a learner; (2) outdegree—the number of messages received by a learner; and (3) betweenness—the extent to which a learner controls the communication between two other students in a community (Kim et al., 2018, in press). The three metrics correspond to popularity, influence, and mediation, respectively. Drawing on prior literature, the current study defines different learner roles in online collaboration each of which is matched with a combination of the thresholds of the three metrics (see Table 1). In our previous studies (Kim et al., 2018), we introduced two models of learner participation classification: three-level model (full participant, inbound participant, and peripheral participant) and four-level model (full participant, engaging participant, peripheral participant, and marginal participant). We hypothesize that full participants, given the social nature of leadership (Wang, 2018), can be identified as learning leaders but insufficient to detail various characteristics of learning leaders.

Table 1: Learner roles

Learner Role	Thresholds for the Metrics		
	Indegree	Outdegree	Betweenness
Full Facilitator	> 75	> 75	> 75
Transactional Facilitator	< 75	> 75	> 75
Attractive Facilitator	> 75	< 75	> 75
Topical leading discussant	> 75	> 75	< 75
Issue Seeker	< 75	< 75	> 75
Active Commenter	< 75	> 75	< 75
Attractive participant	> 75	< 75	< 75
Transitioning Participant	< 75	< 75	< 75
Occasional Participant	> 75	zero or 1	< 75
Marginal Participant	< 75	zero or 1	< 75

Methods

This exploratory study used 21 students (5 male and 16 female) enrolled in a graduate-level online course that taught foundations of instructional design and technology. For 12-weeks asynchronous discussions, Each student was assigned at least a week to serve as a peer-moderator. For the online discussion each week, we extracted social network data on who communicated with whom, how often the learners communicated, and what the

content of their communication was. We used the NodeXL software to calculate the indegree, outdegree, and betweenness-centrality metrics. Using the filtering approach (i.e., the 75th percentile) described earlier, we classified individuals' participation profiles for each week, centering on the three learner roles: full facilitator, transactional facilitator, and attractive facilitator.

Results

As expected, the number of leaders varied across weeks, ranging from 2 to 5 (not including topical discussants), which seemed reflecting dynamic and situational learner interaction in that community. Concerning the topical discussant, at least one topical discussant per week was identified (see Table 2). We decided to take the first three roles as leadership in online discussion community, because those roles fitted our theoretical justification of learning leaders, and conservative approach to identifying leaders seemed better for a small group discussion ($N = 21$).

Table 2: The number of learning leaders in each week by corresponding learner roles

	WK2	WK3	WK4	WK5	WK6	WK7	WK9	WK10	WK11	WK12	WK13	WK15
Full Facilitator	2	1	3	1	4	1	1	1	2	2	1	2
Transactional Facilitator			1	1		2		2		1	2	
Attractive Facilitator	2	3		1			1	2	3	1		1
Topical Discussant	2	1	1	2	1	1	1	1		2		1

We then further reviewed topical discussants. For example, as depicted in the network visualization of week 12 (see Figure 1), two topical discussants (i.e., 216 and 223) positioned around the leaders (i.e., 205, 208, 214, and 219), building their subgroups. We viewed that as far as their participation level is concerned, topical discussants would be at the fully engaged level (i.e., full participant), but still grow to becoming leaders. Therefore, we determined not to have the topical discussant in the leader classifications.

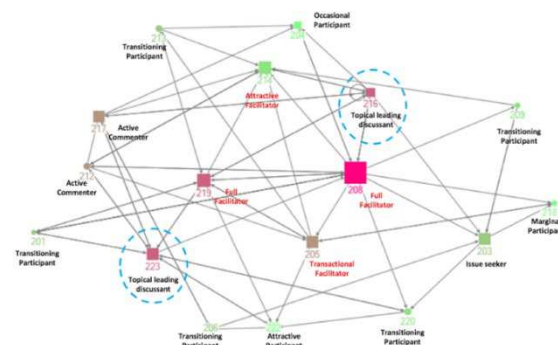


Figure 1. Network visualization of the learner roles

This study proposed how to use social network analysis to identify learning leaders in collaborative learning. This approach paves the foundation for further research that develops real-time instrument for instructors to identify and classify learning leaders, and provide learning intervention and support in a timely manner.

References

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