Social Network Analysis of Interaction in Online Learning Communities

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Abstract

How to optimize the high-value interaction between learners will become the next driver of efficient learning. Social network analysis provides meaningful and quantitative insights into the quality of knowledge construction process. This paper introduces why SNA can effectively assess the performance of knowledge building process. Then, five useful and efficient methods of assessment are presented in detail.

1. Introduction

The practice of online learning communities has spread out continuously in recent years. It has been one of the most important focuses to assess the process and quality of knowledge construction in online learning communities. Most of the researchers can only assess the knowledge attributes of online learning communities, without considering the social attributes and process of knowledge construction. However, the social network analysis can describe, analysis and visualize patterns of interaction and social structures of groups which are formed by learners, and provide many kinds of network indicators to assess the process and quality of the knowledge construction of learners in the social perspectives.

Pattison (1994) claimed that individual position in a social network plays a part in determining the specific information to which the individual is exposed. Furthermore, individuals in different social positions receive different information so that they may come to construct knowledge differently. Carley (1986) emphasized that there is an interaction between social structures and cognitive structures, and social interaction is a driving force behind knowledge acquisition. Overall, social network analysis provides a new paradigm and methods for assessing knowledge building in online learning communities.

2. Methods of Assessment

In online learning communities, SNA analyzes the relationships of interaction among participants by the algebra matrix and graph theory tools to describe the patterns of interaction and characteristics of networks with network measures. In this paper, we will introduce five network indicators in SNA and their applications in online learning communities.

2.1. Indegree

Indegree is the number of connections each node has from other nodes, and is a measure of the extent to which one is chosen by others in the network (Brad Richardson & Nancy Graf, 2004). In online learning communities, Indegree is used to provide information about the number of those who read or build on the discourse topics of a certain participant.

Indegree of certain participant in online learning communities are used three ways: (1) A high indegree for a specific participant indicates that his or her ideas may be influential in the discourse, and the participant has more prestige in the network. (2) Average Indegree can describes the whole characteristics of interactions in online learning communities. A high average indegree of an online community indicates that there is a high degree of building on each other’s discourse topics, one hallmark of collaborative effort. (3) A large variance of indegree suggests that the ideas of the discourse topics posted by a certain participant are more popular than those of others, but the ideas of discourse topics by others are neglected. In this case, the coordinators or tutors of online learning communities should take some measures to eliminate...
the social inequity, or participants with more contribution will be infected and discouraged by the social inequity.

2.2. Outdegree

Outdegree is also an indicator of calculating the centrality of a social network. Outdegree is the number of connections each node has to other nodes. In online learning communities, outdegree is a measure which represents the total number of notes by other participants that a specific participant read or builds on. In a similar way with indegree, we can use three indicators of outdegree: the outdegree value, average outdegree and variance of outdegree. As compared with Indegree Divergence, outdegree divergence is apt to describe the extent to which participants learn actively.

2.3. Betweenness

The betweenness is a measure to assess the extent of brokers’ importance located paths between two actors. In online learning communities, the betweenness of a participant is determined by the extent to which the participant is a “broker”. If information flows among participants are often indirect and via a given participant, the participant has a high betweenness. If a network has a high average betweenness, it indicates that there are at least a few information brokers. Such brokers hold powerful social positions in the network, this is undesirable. The network would support a more democratic form of knowledge building when there are many direct links between participants, rather than individual links (Li Sha & Jan van Aalst, 2003). The democratization of knowledge is an important feature promoted by the knowledge building perspective (Scardamalia, 2002).

2.4. Density

To get an indication of the overall linkage of participants in the network we need conduct density calculations. This gives an indication of the level of engagement in the network. Density calculations indicate how active the participants are involved in the discourse (Maarten de Laat, 2002). Density is the quotient of the number of actual relationships and the number of all possible relationships in the social network, the value of density varies between 0 and 1. So, in online learning communities, density can show how dense is the participation within it.

2.5. Cohesion

There are several methods to make cohesion analysis to describe the quality of knowledge building in an online learning community, such as cohesion index, the number cliques and the number of participants in one clique. Firstly, a low C-Idx indicates there are substantive relationships of interaction among participants of different cliques, or a participant take on many roles in different cliques. This will widen the scope of communication of information in the whole network. Secondly, the number of cliques of a network can somewhat indicates the relationships of interaction among participants of online learning communities. If the number of cliques is larger, the interaction among participants is dense. This is propitious to knowledge construction. Lastly, the number of participants is large in each clique, this means that the scope of communication among participants is wide, which improves the quality of knowledge building.

3. Conclusion

Relationships of interaction in online learning communities can influence the process and quality of knowledge building in online learning communities. This paper introduces five methods to assess processes of knowledge building in online learning communities. But this paper does not deal with the details of how to trace the actions of learners and generate the results of analysis automatically. So we will design an integrated and powerful collaborative learning system which will accomplish the task.

4 References


