Chapter 6
Analysis of Students’ Engagement and Activities in a Virtual Learning Community: A Social Network Methodology

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ABSTRACT
With advances in communication technology and online pedagogy, virtual learning communities have become rich learning environments in which individuals construct knowledge and learn from others. Typically, individuals in virtual learning communities interact by exchanging information and sharing knowledge and experiences with others as communities. The team at the Virtual Learning Community Research Laboratory has employed an array of methods, including social network analysis (SNA), to examine and describe different virtual learning communities. The goal of the study was to employ mixed methods to explore whether the content of students’ interaction reflected the fundamental elements of community. SNA techniques were used to analyse ties and relationships among individuals in a network with the goal of understanding patterns of interactions among individuals and their activities, and interviews were conducted to explore features and student perceptions of their learning community.

INTRODUCTION
Traditional classrooms offer interesting contrasts to e-learning classroom environments when considering the types of communities that can evolve within these environments. In traditional classroom, learning communities are visible to the instructor and students can easily make connections with peers due to availability of rich visible social cues. As such, research suggested that instructors can actively nurture the sense of a community among students (Daniel, Schwier, & Ross, 2005). In virtual learning communities, however, where learners are often isolated from

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each other and the instructor, developing a sense of a community, though critical, can be difficult. The sense of isolation among learners in online environments can be minimized if forethought is given to the development of the online milieu that can foster a sense of a community among learners. As McDonald, Noakes, Stuckey and Nyrop (2005) observed that in many online contexts learners report feeling disconnected, and experience an isolation or social exclusion that impacts on their levels of participation, satisfaction and learning.

This study employed social network analysis (SNA) techniques to visualise and understand structural patterns of interactions in a formal virtual learning community. The structural pattern of the network was corroborated by data drawn from participants through interviews and focus groups in which participants openly discussed their experiences about sense of a community online and factors that they considered critical to maintain it.

In recent years, many methods have been employed to study the flow of information among individuals and communities, ranging from empirical to theoretical. The defining feature of SNA is its focus on the structure of relationships, ranging from casual acquaintance to close bonds. SNA assumes that relationships are important. It maps and measures formal and informal relationships to understand what facilitates or impedes the knowledge flows that bind interacting units, who knows whom, and who shares what information and knowledge with whom by what communication media (e.g., data and information, voice, or video communications). SNA is a method with increasing application in the Social Sciences and has been applied in areas as diverse as psychology, health, business organization, and electronic communications. More recently, interest has grown in the analysis of leadership networks to sustain and strengthen their relationships within and across groups, organizations, and related systems.

A social network is a set of individuals who are connected to one another through socially meaningful relationships (Hanneman & Mark, 2005). According to social network theory, social relationships are viewed in terms of nodes and ties. Nodes are individual actors within the network, and ties represent the flow of relationships between actors. In its most simple form, a network graph represents a map of all of the relevant ties between the nodes in the community. De Laat (2002) used social SNA to understand interactions patterns in virtual communities.

Several measures have been employed to understand the structure of a social network. These measures include “betweenness” which refer to the degree an actor lies between other individuals in the network. For example it describes the extent to which an actor is directly connected only to those other individuals that are not directly connected to each other. Betweenness is sometimes described as an intermediary; liaisons; bridges. Betweenness also connotes the number of actors in which a node is connected to indirectly through their direct links.

SNA can also describe a broad suite of techniques that incorporate a variety of methods and applications, yielding a rich research tradition that is beyond the scope of this study to summarize fully. Important threads have included the development of methodologies to characterize networks, including mathematical tools such as graph theory, which incorporate rich statistical tools to handle interdependency among represented nodes and edges in a given graph. These relations defined by linkages among nodes are a fundamental component of SNA and are increasingly used to understand and describe various social networks (Freeman, 2004; Scott, 2000).

There is significant potential for employing SNA techniques to understand virtual communities. Wellman (1999) proposed mapping the virtual community activities onto social networks, taking into consideration among others features such as density (how people in the network are connected to each other), boundedness (how closed the community is), range (how wide is the range...
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