Social Networks and Learning Networks:
Using social network perspectives to understand social learning

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Abstract

The empirical studies, theoretical perspectives and analytical tools associated with social network analysis (SNA) comprise a wealth of knowledge that can be drawn on for interpreting, analyzing and designing networked learning. In its essentials of understanding the network connections between people, or other network nodes, SNA seems a natural addition to the networked learning researcher's toolkit. This paper builds on the networked learning 'hotseat' discussion held online in October 2009 as one of the preliminaries to the 2010 Networked Learning Conference. The discussion aimed to explore social network principles as a way to address questions about networked learning. This paper follows up that discussion, bringing together and expanding on topics discussed during the hotseat. Our thanks go to the participants in that session for raising important and challenging questions about networks, and networked learning.

Keywords

Social network analysis, networked learning, hotseat discussion

Introduction

This paper builds on the networked learning 'hotseat' discussion held online in October 2009 as one of a series of online discussions organized by Maarten de Laat as preliminaries to the 2010 Networked Learning Conference in Aalborg, Denmark. In the first hotseat of the series, Caroline Haythornthwaite led a discussion on "learning networks", with a primary intention of discussing the application of social network perspectives to networked learning. Here we carry on that discussion, drawing on the online discussion to frame the organization of the paper, and expanding and elaborating on the synergies we see between work done on social networks and what we know and are trying to learn about networked learning. To clarify, this paper, and the discussion forum before it, are not about social learning, but instead about how the networks formed between people create structures on which learning opportunities arise. Our intention was, and is, to bring attention to the method and principles associated with social network analysis to the networked learning audience in order to bring those to bear on research questions of interest to networked learning scholars.

The paper first presents a very brief overview of the building blocks of a social network perspective: actors, ties, relations and networks. Followed by an outline of what is meant by networked learning. Then we will continue our discussion on networked learning fueled by addressing the central issues that were discussed during the hotseat. The paper addresses the following:

What constitutes a learning tie? What is the 'glue' that sticks people together in a learning network? And, how do these ties relate to the kinds of outcomes are desired and possible with networked learning?

How do individual positions and network configurations affect access to and the ability to act on networked learning?

What can a social network perspective contribute to questions of measurement and evaluation, learning processes, and benefits and outcomes of networked learning?

How do networks and networked learning play out in formal and informal learning, ranging from educational settings to leisure pursuits?

How do we reconcile the individual's view (called ego networks) – of dynamic, ever changing experience, enacted with multiple others and via multiple means – with a whole network perspective on the configuration of learning networks?

Social networks

Before turning to the application of SNA to networked learning, we present first a very brief introduction (see figure 1). While the principles of analysis for social networks are based on graph theory from mathematics, the substantive theoretical work relating to interpersonal and communal relationships comes primarily from the fields of sociology and communication. These fields concentrate on how relationships between people form networks of connections that create opportunities for access to resources such as jobs, information, or material goods and services. Currently the concepts and cross-disciplinary potential of principles of networks, as derived from graph theory, are gaining substantial attention across fields, for example, in bringing together ideas small world structures from physics to bear on the social results embodied in the idea of 'six degrees of separation (Milgram, 1967), and a more cross-disciplinary approach that is becoming known as "network science" (Watts, 2004). Our emphasis here is on continuing the *social* network perspective, which, as well articulated by Borgatti, Mehra, Brass & Labianca (2009), has a long tradition and an important empirical and theoretical base to draw on.

Figure 1: Social Network Basics
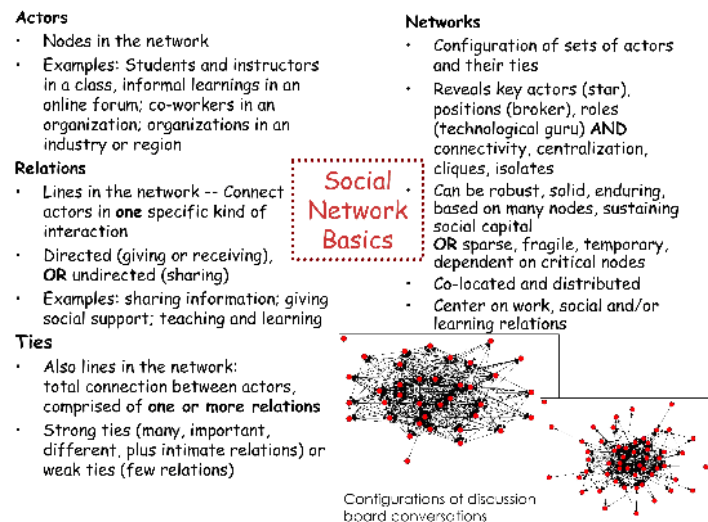
In brief, the building blocks of social networks are the nodes or actors in the network and the connections between them. Examples include students; instructors; informal learners in an online forum; co-workers in an organization; colleagues on a research team; organizations in an industry or region; members of a listserv or an academic discipline.

Actors may be individuals, organizations, communities or other kinds of collectives. In principle, actors may be of different types (e.g., human-animal models of transmission of diseases), or non-human (studies

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have been done of primates and other animals and insects). Actors may be inanimate objects, particularly animate-like computer programs. However, there is little work at this stage that has applied social network analysis to include objects, and interpretations of the social aspects of networks that include mixed and/or inanimate objects will require careful thought. Thus, we leave that aspect aside for the current discussion. Here we concentrate on person-to-person interaction and the application of current thought about networks to learning networks.

The connections between actors are known as *relations*. Actors may be tied by one or many relations, and these may vary from impersonal to intimate, be infrequent or frequent, and optional or required. When actors maintain at least one kind of connection, they are said to be tied. Such ties may be weak – where the interaction is infrequent, unimportant, or incidental; and ties may be strong – where the interaction is based on multiple kinds of interactions, reciprocity in the relationship, and self-disclosure.

The actors and the relations that tie them form networks – patterns of connections between members of a designated set of individuals, such a students in a class, team members on a project, or teachers in a school. Networks can be drawn based on any connection between people, e.g., by asking a general question such as "who do you talk to?" of each member of a given set of people. Networks may also be drawn based on more specific questions, e.g., "who do you discuss important matters with?" (Burt, 1984) or "who have you worked with in the last week?" De Laat (2006) developed an integrated multi method and time line approach to analyze evolving network dynamics. This methodology aims to describe a more complete picture of the processes and activities involved when engaging in networked learning, by combining questions as "who talks to whom?", with "what are they talking about?" and "why are they talking as they do?"

We say networks are drawn because they can be depicted in sociograms, i.e., social network pictures. Visualizations are an important aspect of current social network analyses, and range from simple line and node drawings to more visually stimulating and mathematically sophisticated renderings. Some online examples can be found online at these sites:

Garton, L., Haythornthwaite, C. & Wellman, B. (1997). Studying online social networks. *Journal of Computer-Mediated Communication*, *3(1)*. http://jcmc.indiana.edu/vol3/issue1/garton.html

De Laat, M. F., Lally, V., Lipponen, L., & Simons, P. R. J. (2007). Patterns of interaction in a networked learning community: Squaring the circle. *International Journal of Computer-Supported Collaborative Learning*. DOI 10.1007/s11412-007-9006-4.

Learning networks depicted on the University of Wollongong's website (Retrieved November 12, 2009 from http://research.uow.edu.au/learningnetworks/seeing/about/index.html)

Visual Complexity site, and particularly the social network visualizations (http://www.visualcomplexity.com).

This introduction lets us now turn to thinking about what relations, ties and network properties are important for networked learning, and lets us consider further what is known about social networks in other areas that can be applied to networked learning.

Networked learning

Networked learning is a term introduced around the mid-1990's to refer to ways new communication technologies can influence teaching and learning[1] (Harasim, Hiltz, Teles & Turoff, 1995; Goodyear, Banks, Hodgson and McConnell, 2004, Siemens, 2004; De Laat, 2006). By networked learning we mean the use of ICT to promote collaborative or cooperative connections between learners, their tutors/instructors, and learning resources (Steeples and Jones 2002). In designing and including ICT in formal learning there is

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[1] Other terms and backgrounds for network learning include distance learning, computer-aided instruction, asynchronous learning networks (ALN), computer-supported collaborative learning (CSCL), learning sciences, online learning, and e-learning. Perhaps more restricted in their domain, but also influencial as the technologies widely used to support networked learning are virtual learning environments (VLEs) and course or learning management systems (CMS, LMS). See Andrews & Haythornthwaite (2007) for several chapters discussing the backgrounds to the area of e-learning (e.g., the introduction Andrews & Haythornthwaite; Hiltz, Turoff & Harasim on ALN; Hoadley on learning sciences; and Thompson on distance education).

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an inherent goal of enhancing the efficacy of learning among participants, and initial studies in networked learning focused on exploring the affordances of technology to support learning (Goodyear et al. 2004; Conole and Dyke 2004).

But, as ICTs drive new forms of collaboration and contact, and also drive the need for more and varied presentations of learning, networked learning is well placed to address the way learning happens informally on and through the Internet with its focus on building and cultivating social networks and seeing technology as one part of this process rather than as an end in itself (Haythornthwaite, 2008; De Laat 2008). Networked learning also engages with the continuing development of the network society (Castells, 1996) and the ever-growing use and dependence on information and communication technologies (ICTs) and social networking on the Internet. Thus, it addresses the synergy between contemporary and emerging use of technologies in everyday life and in learning, and makes a relevant framework for the study of professional development and lifelong learning.

Social network research has shown that having an extended network is crucial for personal and professional development. Both weak ties, held with acquaintances , and strong ties in long-lasting friendships and community memberships are important for learning. Weak ties (also called bridging ties, e.g. Putnam 2000) are important for gaining access to new knowledge (Granovetter, 1973). Levin and Cross (2004) found that for informal learning and professional development people rely on weak ties with competent people they can trust. Strong ties, with those who are close to you, are needed to deepen and embed knowledge closely related to day-to-day shared practice, as well as commitment to joint activities (bonding; Krackhardt 1992). In the field of teacher professional development, some key studies show that teacher networks add value for implementation of innovations, teacher development, school leadership, and improved teaching practices (Lieberman and Wood 2002; Dresner and Worley 2006; Earl and Katz 2007; Katz and Hands 2007). Studies by Burt (1992) also show how positioning yourself appropriately in a network enhances your opportunity to be an entrepreneur. As schools and other social context begin to emphasize social entrepreneurship, network connections become an important consideration in implementation and successful building of alliances toward new professional practices.

Networked learning is an emerging perspective on learning that aims to understand the network processes and properties – of ties, relations, roles and network formations – by asking how people develop and maintain a 'web' of social relations for their own and others' learning. A well-known example of a closely-knit social structure associated with learning and commitment to joint practice is a community of practice (Wenger, 1998). What is the nature of ties and relations that determine learning in such relationships? (De Laat, Lally, Lipponen and Simons, 2006). In communities people develop tight, long-lasting social relationships related to their practice and domain. However, emergence and cultivation of communities is a difficult process, and even apparently successful ones may fail (Bruckman, 2002). Successful communities may also turn their attention inward, preserving and deepening group knowledge, but failing to capture new information. A strong core may also dissuade participation by those outside the central core, or fail to provide an environment where newcomers can come to understand norms and practices through legitimate peripheral participation.

Communities of practice are often formed to place an emphasis on strong relationships engendering a certain closeness and unity of purpose (Jones, Ferreday and Hodgson, 2008). This attention to strong, purposeful relationships is also evident in technology design to support particular tasks or working relationships, such as efforts in computer-supported cooperative work, and computer-supported collaborative learning. A networked perspective encompasses more and different relations, looking at the diversity of social relationships people develop, the diversity of ties (weak to strong), and the diversity of relations (work, learning, social) – that make up communities and other forms of social structures. For example, in the area of professional development for teachers, what matters is the relative number of contacts one has to share work related experiences with. This can mean talking with one or more colleagues in the hallway or in the coffee corner; sending an email, skype or phone with a few peers around the world; or sharing your experience with one or more communities. Networked learning puts the emphasis on the learner and tries to maximize the network in which this person navigates in support of his or her learning, whether this learning is personally driven, collaborative or collective.

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As more and more people participate in multiple online communities – learning by observation in some, and participating strongly in others – extending the scope of learning to include lean and rich engagement with a community and with others is becoming more important for understanding individual experience in a multi-dimensional, multi-membership, and multi-identity[2] world. Networked learning thus engages with a wider view of the influences and impacts on individual's ideas and knowledge acquisition, a view that is synergistic with the greater availability of information and social contacts accompanying developments on the Internet.

Discussing Networks

The hotseat discussion[3] followed a simple structure where researchers around the globe interested in or active in networked learning research could participate in a week long asynchronous discussion about learning networks. The discussion on "learning networks" was initiated to explore how social network principles could help inform the general area of networked learning.

The social networking site on networked learning is set up to stimulate and build relationships world wide with the desire to widen participation from researchers who are not able to attend the bi-annually Networked Learning Conference. At present we have over 300 registered members coming from about 50 different countries. During the hotseat week led by Caroline Haythornthwaite we had a total of 70 written messages, which were viewed 4400 times. Google analytics indicated an involvement, during that week, from people from about 25 different countries (see table 1 for a spread across the continents).

Continent	Unique page views for the hotseat
Europe	429
Americas	103
Africa	20
Asia	12
Oceania	5

Table 1: Hotseat participation per continent

The discussion opened with the central question "what constitutes – or is needed to constitute – a learning tie?" During the week, messages were posted to the forum raising and exploring essential issues about nature of learning in social networks. Here we take the opportunity to bring these issues together both to record them, and to expand them based on work done in networked learning and our own research in this area.

The first issue explored, raised the fundamental question about what is the nature of a learning tie. When or how is a network connection experienced as one where learning occurs, and what is the glue that sticks people together in a learning network? This sparked of a conversation about the nature of a tie: Does this has to be an interpersonal one or can it also be a link to material-based resources as well? Or, are material resources not a human product as well and therefore all links are interpersonal whether or not people are aware of these connections?

As noted during the discussion, at issue here is whether we are speaking strictly of social network analysis methods or whether we are talking more generally about connections between people, resources, ideas, etc. Social network analysis, with its roots in graph theory, is applicable to any connection between nodes, but interpretation of learning networks requires a more careful consideration of what to choose as nodes. If we restrict the discussion to *social learning*, then we may want to maintain

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[2] A growing body of work examines issues of maintaining identity in and across multiple spaces and places, particularly as individuals cycle through different roles more frequently, e.g., a named teacher in one venue, an anonymous learner or a named student in another; game player in one venue, serious worker in another. Classic references in this area include Merton, 1957 re roles; Strauss, 1978, re multiple worlds; and Turkle, 1995, re life on the screen.

[3] http://www.networkedlearningconference.org.uk/index.php/community/login-logout

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a focus on people, with questions such as: Who learns from whom? What do people learn from each other? How learning interactions between pairs support or configure the knowledge held in a network?

But some participants in the forum quite rightly pointed out that we also learn from resources. Hence how are resources to be included in the network? Again, appealing to an SNA perspective, we can look at what are called two-mode networks. Common exposure to an event, such as attending a lecture or reading a book or working on similar tasks, can be seen as the groundwork for a common understanding. This is, of course, the basis of notions of common curriculum, and ideas of the way school socializes individuals into their culture (Bordieu's cultural capital; see Crook, 2002). It is also the basis of reading programs that promote city-wide or university-wide reading of the same book (e.g., "Chicago Read").

The basic principle of a two-mode network approach is to consider events as one dimension, and people as the other. For example, given a group of 25 people and 10 books, which has each person read? This can be used to create a person-to-person network based on common reading patterns. One caution is that these people need never have met to be considered together in this network. Hence, while they may have common knowledge, it would be hard to say they have engaged in *social* learning. Common exposure to ideas, however, is an important constituent of education and while it may not focus on the act of learning, it does focus on the overall intent of education. It has a place in networked learning when we consider common exposure to online resources, the creation of common curricula delivered to people around the globe. Common connections are being made by the very act of distributed, online, networked learning. Again, although this may not satisfy pursuit of the act of learning, it can reveal important structural elements of the impact of distributed, networked learning on global knowledge.

Participants did question whether common exposure was truly learning, and indeed how we get at the notion of learning in a networked context. Leaving aside the psychogical processes in the individual, and remaining with the *social* aspects, then we need to turn to the activities of learners. Here we return to the notion of what constitutes a "learning tie" – i.e., what is it that people do with each other that promotes their learning process? Social learning theory provides some guidance. Processes of dialogue and interaction between people are important for processing and reprocessing information on the way to understanding it. For some, this also includes manipulating physical objects, or working out problems. Trying the idea out – on others, on the world – are important and essential parts of the learning and social learning process (Cook & Brown, 1999). While the work of understanding what interactions matter for networked learners is at a nascent stage, much work focuses on the collaborative aspects of learning (Koschmann, 1996; Miyake, 2007). The popularity of this approach has, in part, been the way turning interaction over to peers makes the instructor role more manageable. In a 24/7 world, instructors cannot be the only contact point for dialogue, and online learning has both made necessary, and legitimated, peer-to-peer interaction.

Questions remain, however, about what constitutes collaboration, and collaboration in the service of learning (Haythornthwaite, 2006), and how we harness conversation for learning (Laurillard, 2002). And, if we want to examine an online learning transcript for evidence of collaboration, conversation, or learning, what do we retrieve? What metrics matter for networked learning? Returning to a social network perspective, it is not clear that a simple post and response is sufficient to say there is a tie between pairs (De Laat and Lally, 2004). Indeed, Rafaeli and Sudweeks (1997) make a compelling argument that interaction requires a post, response and a subsequent answer from the original poster. It may be only at that point that we can 'count' collaboration as having occurred in networked learning (see also Haythornthwaite & Gruzd, 2008, and under review). De Laat (2006) has argued to combine this type of methodology with a time line analysis to understand how people's engagement with learning and peer support develops and evolves (see also, Haythornthwaite, 2002).

Another important component of learning is its application or re-embedding into local or personal contexts. This brings us to the question about how networks play out in formal and informal learning contexts. With appropriate scope, formal networked learning (e.g., in the context of courses) can make good use of local context. Kazmer (2007), for example, describes how distributed networked learners are able to bring their local context into the class which enriches the in-class experience, but they also take the in-class knowledge out to local social environments for discussion and application in settings they work and live in. The network influences of networked learning thus entail both drawing from and extend

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into local communities, therefore blurring formal and informal boundaries. A study into student experiences with e-learning (Conole, De Laat, Dillon & Derby, 2008) that compared tools used for *on-task* and *around the task learning* (on-task refers to planned collaborative activities undertaken by the students together in their own group in their VLE, around the task refers to more informal, spontaneous activities students organize to facilitate their (on-task) learning) (Benfield & De Laat, in press), showed that students use a wide variety of social software and communication tools to connect with their peers (classmates and beyond), friends and others in support of their learning assignments. This indicates that students frequently cross between formal and informal contexts, to strategically build and maintain a web of social relations used for their learning. At the same time this work shows how people combine multiple membership drawing on their personal networks to discuss and solve questions that are part of a collaborative learning task 'belonging' to a student community they are a member of at their university.

Consideration of the community, and the individual embedded in it, brings us to another major issue discussed in the forum which concerns what kind of perspective you take when looking at networks. How do we reconcile the individual's view of a dynamic, ever changing experience, enacted with multiple others and via multiple means with a whole network perspective on the configuration of learning networks? Here we bring in two further social network terms – ego or ego-centric networks, and whole networks. The former describes the position from the view of the individual. Thus, a networked learner sits at the center of a network that includes their teachers and classmates, plus a potentially huge range of other people associated with school or their area of interest (other faculty and members of other classes; others in the program, interested in the same subject, or working in the area). Outside school, their network includes family (parents, spouses, children), friends and acquaintances, and work colleagues, some of whom may or may not share an interest in what they are learning. We may also consider the information network of these individuals: the text or readings set for class, the extra (formal) resources they find for their papers, news reports, blogs, and more informal online resources. Considering the network from the learners' perspective provides a view of who they learn from (beyond the teacher, and beyond peers), but also where conflicts in understanding may come from (e.g., unvetted online resources). It also reveals the conflicting – or complementary – demands on individuals, particularly for adults at work.

By contrast to an ego-centric view, a whole network view provides a range of information about how information – and learning – is occuring across a set of people. A whole network perspective provides a view of the entire structure, and thus of the 'character' of the network to which an individual belongs. Is the network collaborative: e.g., do most or all people freely share information, engage in discussion, or help search for information? Is the network divided into cliques, and if so on what basis (information hoarding? different interests? separate tasks?). Perhaps the most important contribution of SNA is this whole network view that takes the results of pair-wise connections to describe what holds the network together. As we begin to use SNA to examine and reveal learning networks, we are just at the beginning of understanding how and what makes for the kinds of network outcomes we desire.

Conclusion

This paper is a continuation of a discussion initiated during the online hotseat discussion on learning networks. We felt that this discussion raised a lot of important current questions networked learning researchers are faced with. During this discussion many perspectives on these questions were shared and somewhat explored. In this paper we have taken the opportunity to further this exploration by drawing on our own work and that of others in the area of networked learning and social networks. We see promise in applying SNA to networked learning in part because the wealth of studies of social behaviors from this tradition create a set of principles and results that bear on learning, from the ideas of community social capital to group cohesiveness and information flow (Haythornthwaite, in press). The challenge is to harness these principles and methods to address problems important and relevant to networked learning. This paper and the hotseat discussion begins the process, with an overview of contemporary research issues researchers can take into account when engaging and designing studies exploring a social perspective on networked learning. We look forward to conversations at the conference to further enlarge this area of inquiry.

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