Using Social Network Analysis to Explore the Dynamics of Tele-mentors' Meta-support in Practice

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Abstract. Little research has been conducted on human support in CSCL situations. Extensive investigations on human meta-support are, in fact, rare. In this study, we have developed a set of mechanisms to facilitate human meta-support in a CSCL environment. Thirteen cognitive-affective pairs of mentors who facilitate a total of 82 forum groups share and discuss their mentoring practice in an exclusive Mentoring Forum. Using Social Network Analysis, we have explored the dynamics within and among pairs of mentors to reveal how they engaged in this environment and how they co-constructed their knowledge on how best to support a group of learners.
Keywords: meta-support, paired telementors, synergetic scaffolding, SNA

Introduction

Much software has been designed to support the learning of individual mentees while little to none has been developed to support telementors in sharing their ideas and beliefs on synergetic mentoring. Our research team has developed a web-based software suite designed to support telementoring in our inquiry-based science learning programs, Lain (Learning Atmospheric science via InterNet). In this study, we focus upon analyzing the interaction of telementors in an exclusive, Mentoring Forum. Within this private area, telementors can share and seek advice from colleagues before taking action. Our goal was to explore the dynamics among telementors and to examine how such a simple mechanism can facilitate the practice of meta-support and also enhance synergetic telementoring. We first explore how these telementors utilize a private forum as a resource for human meta-support, then identify how these pairs of telementors interact with each other and other pairs in a mentoring community.

Methods

Twenty-six volunteer mentors (13 males and 13 females) participated in facilitating 491 high school learners in a virtual summer camp in Lain 2003. Mentors were paired according to their academic backgrounds, those majoring in the sciences as cognitive mentor (mentor A) and those with non-science majors as affective mentor (mentor B). In participation-oriented practice, cognitive mentors are responsible both for fostering mentee learning of content and also learning how to participate in collaborative inquiry discourse practices. Affective mentors, on the other hand, engage in an intensive effort to get mentees to do inquiry themselves, for example, to pose questions themselves, as well as to pursue their own explanations in scientific practice. Since the camp was held during summer, most of the volunteers were elementary to secondary school teachers or graduate students with majors in the learning sciences. Together, they posted a total of 2936 articles over six weeks. On average, each mentor posted 112 articles in 5-8 group forums.

We designed two levels of meta-support mechanisms for them. One mechanism exists at the within-paired level, Footnotes. The other mechanism exists at the between-paired level Mentoring Forum a general forum for all telementors. The Mentoring Forum is designed to enable them to have a "coffee break" in the teacher's lounge whenever they choose to share their mentoring experiences from different forums. Since mentees are prohibited from entering this space, telementors can also share their impressions and personal concerns about things that have happened in their respective group forums.

Postings from the Mentoring Forum may be treated as relational data, stored in a matrix, and subjected to an analysis of interaction patterns. Social Network Analysis (SNA) is used to analyze the social structure of such a mentoring COP. Our approach differed from that of many researchers who have used email communication in a distributed community of learners (Sylvan, 2006), or have used the number of messages written and how many times and by whom a certain message was read (de Laat, 2004; Reffay & Chanier, 2003); but was conceptually similar to indirect relationship networks, which used relationships established through a shared object (such as the creation and later reading of a document in a shared workspace)(Martinez, et.al., 2006) as entry data for SNA.

However, we developed an alternative way to transform the interaction dynamics of the mentors within such a forum. To illustrate: We regard the contributors to any single thread as having similar interests in response to that issue. The social network relationship is defined for each couple (a,b) in a thread, in terms of *joint contribution* to that same thread. In other words, we count the relationship of co-construction by measuring the proximities between two agents instead of just agent a opening a message which is posted by the agent b. Therefore the conceptual unit of analysis becomes the thread, rather than the posting. Following this approach, we first created a thread-by-participant table, and then transformed it into a participant by participant matrix. This network proximity (Cho, Stefanone, & Gay, 2002) matrix was then used as input data to generate an SNA graph to identify how these pairs of telementors interacted with each other and to what extent the same/different roles of telementors (e.g., cognitive mentor A or affective mentor B) had common interests in contributing to various mentoring issues. For the purpose of exploring telementors' social network relationships, we excluded the postings of the coordinators from the following analysis.

The Mentoring Forum Activity

Table 2 shows the distribution of 13 pairs of telementors among the remaining 630 postings. On average, the mentors contributed 24 postings each. The standard deviation was 20. 32 percent of threads consisted of a single posting, which brought the average length of threads down to 3 postings each. As we can see in table 2, mentor B contributed more postings in general than did mentor A. There were three mentors B (7B, 9B, 12B) and one mentor A (7A) who were very active and shared more than 50 articles in this forum. From this paired distribution, we notice that paired mentors of both #4, #10 and #13 contributed very few postings. Mentors 3B and 9B have significantly higher posting counts than did their assigned pairs 3A and 9A. In order to explore how these interactions intertwined among pairs in juxtaposition with the different roles of the telementors, we need further examination with SNA to uncover the communication structure of the mentors as a group.

The Dynamics of Telementors

In order to measure the proximities among these mentors in terms of their contributions to the same threads, the co-occurrence of postings between every two mentors were counted (Table 2). From this matrix, we identified a couple of mentors who had similar interests when engaging in the Mentoring Forum. Information in Table 2 can be explored in terms of the affective role shown in the bottom-right, the cognitive role in the upper-left area, and A-B paired mentors in the bottom-left area along with the diagonal line, and finally in terms of A-B outside their assigned pairs shown in the bottom-left area, respectively. This matrix also shows that the interaction among affective mentors seems to take place with greater frequency than that of cognitive mentors.

Table 1 The distribution of postings among 26 telementors

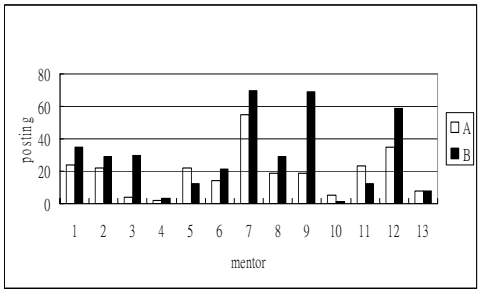
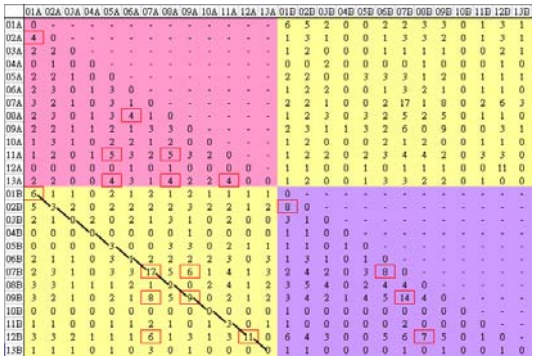


Table 2 The matrix of co-occurrence of cognitive-affective paired mentors contributing to the same thread



This initial proximities analysis in Table 2 was very helpful in interpreting the results of SNA in Figures 1 and 2. In Figure 1, the graph shows the entire social network of 26 mentors. Lines between members indicate that they jointly contributed to the same thread. The relationships between the different nodes indicate roughly which mentors were more closely linked to others. From this graph we see two subgroups in terms of the roles: one cluster at the lower part of the graph is composed mainly of cognitive mentors, with the exception of two affective mentors, 5B and 11B; and the other at the upper part is composed mostly of affective mentors, with the two cognitive

mentors, 12A and 1A, appearing about the periphery and one at the center (7A) surrounded by all the affective mentors. It's very interesting to explore further what happened in this social network.

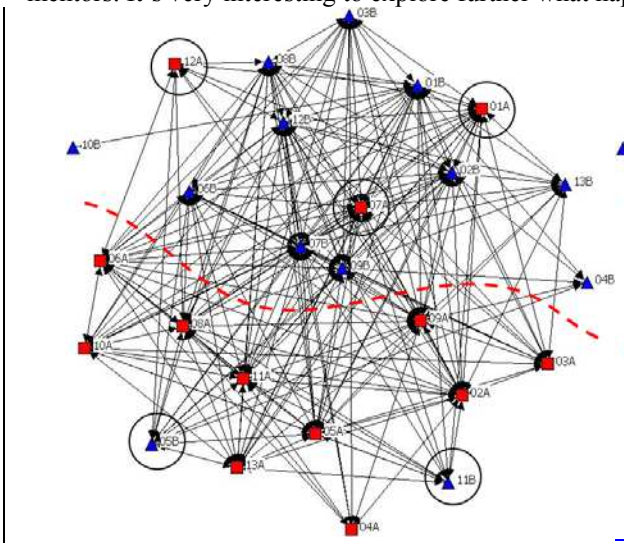


Fig.1 Graphical representation of forum contribution

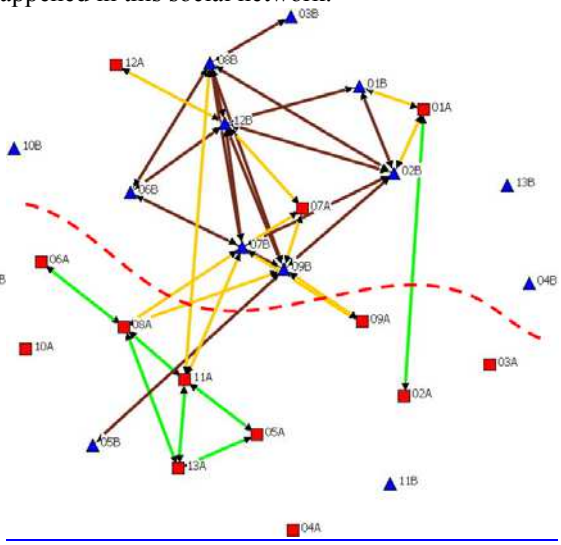


Fig. 2 Reduced graphical representation of forum contribution

The graph in Figure 2 is identical to Figure 1 but shows only co-occurrence instances greater than 3. By comparing all interactions in Figure 1 with the strong co-occurrence in Figure 2, we can see better where stronger interactions exist. The smaller group consists mainly of five cognitive mentors, while the other bigger one consists of eight affective mentors and three cognitive mentors. The insights provided by this reduced graph imply several things. Firstly, the more active cognitive mentors in the bigger subgroup either shared cognitive domain knowledge that was needed by these non-science major affective mentors, or they were jointly engaging in affective affairs. It is these four cognitive mentors, 7A, 12A, and 1A who developed more connections with affective mentors and promoted distributed expertise within these telementoring communities. Secondly, although some of the paired mentors frequently share cases occurring in their respective group forums with all the other colleagues (e.g., 12A and 12B), the active cognitive mentors also pursued discussions on many similar subjects of interest with other affective mentors as well. Thirdly, the members that bridge two subgroups of social networks are 7B, 9B, and 8B for the affective mentors and 8A and 11A for the cognitive mentors. The SNA shows that their interests cross the boundary between the same role and the assigned pairs.

We made some cautious modification to analyzing social networks with SNA. We put emphasis on the proximities of persons contributing to the same thread, rather than on a loose correlation of the relationship of message reading and sending. The results show that, besides the pre-assigned pairing of these mentors, the SNA graphs also reveal links among cognitive as well as affective mentors of different pairs. Two clusters with mixed types of interaction represented in our reduced social network graphing provide evidence of synergetic scaffolding in the Mentoring Forum. From this point of view, telementors participate in their own forums, and observe colleagues in their respective forums, and, mediated simultaneously thus by the Mentoring Forum, are supported in becoming more reflective about, and conscious of what they are doing, and thereby develop more meta-knowledge on how best to implement scaffolding in their community.

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