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## **8. A Semi-Visible College: Structural Effects on a Social Networks Group**

### Abstract

This is a report of an examination of the impact of EIES on the structure of interpersonal relations among a set of participants. Sociometric data were collected at the start of participation and compared with those collected after seven months of activity. Results suggest that EIES participation affects not only the patterns of intellectual exchange among participants but their more personal relationships as well.

### Introduction

This is a report of the first seven months of electronic information exchange by a collection of specialists in the study of social networks. As a collectivity of specialists, we are pretty much like the Futures or the General Systems groups (as described elsewhere in this volume). We come from a broad range of disciplines, we are spread out through seventeen states and two Canadian Provinces and we are involved in an emerging field of science. Like those other groups, we are at a stage in our development as a field where regular and significant communication is essential if we are to develop consenses and the norms and standards that are needed for growth.

Our overall responses to the EIES experience have also closely paralleled those of the Futures and General Systems groups. We succeeded in recruiting a small core of very active participants, but overall activity rates were rather low and a number of seemingly eager applicants never appeared on

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the system. We were able to develop a few worthwhile intellectual efforts, but most of our conferences failed to sustain a continuing intellectual thrust; they withered and died. We found that EIES participation greatly simplified the solution to a number of practical organizational problems, but we were continually frustrated by its tendency to demand attention and intrude on our other day-to-day activities. In short, we were--pretty much--a typical EIES trial community; we had both positive and negative experiences.

From the beginning, we also shared with several of the other trial groups a concern with using EIES to develop a sense of community among the participants. In our case, however, this concern was central. As social networks scientists, we were conscious of the importance of communication in facilitating the development of linkages between persons. Only by establishing such interpersonal links could we hope to arrive at the common understandings, norms and consenses needed in a developing field.

Even before the EIES trials started, one of our number, Mullins (1), had suggested that the emergence of a specialty in science requires more than the sort of communication that is provided by journals, the mails or even the telephone. Mullins proposed that a developing field needs the kind of communication that can engender friendship and trust--the kind that is usually associated only with long term face-to-face colleagueship. Thus, as networkers, one of our main concerns all along has been a question about how well EIES could be used to develop intimate interpersonal ties between participants.

Beginning as we did, with a sort of loosely knit collection of scholars with overlapping interests but few interpersonal ties, we wondered whether we could use EIES to develop into a real community characterized by ties of friendship and trust. Participants on EIES are at least potentially accessible to each other. They have a sort of interpersonal visibility that they might otherwise lack. The problem is whether this semi-visibility can help us to evolve from a mostly anonymous collectivity to a genuine tightly knit academy.

These were the sorts of questions that were prominent among those asked by the social networkers as we entered the EIES world. These questions are addressed, in a preliminary way, in this report. We will examine the impact of the EIES experience on the sociometry of the social networks community.

Sociometric Analysis

Data for the current analysis were generated by two questionnaires, the first of which was administered interactively on EIES at the very start of the experimental trial period. The second set were mailed out to participants seven months later. Altogether, 29 participants completed the questionnaire both times. These 29 people generated the data for the present report.

The questionnaires contained four items that are relevant to the determination of interpersonal contacts among participants. 1. Each participant was asked to designate all other participants that he or she had "heard of or read." 2. Participants were asked to indicate those others whom they had "met, exchanged letters or phone calls or computer-conferenced with." 3. Next, they were asked to indicate those others whom they considered to be "friends." 4. Finally, they were asked to indicate those others whom they considered to be "close personal friends."

These are the data that are examined in the current report. They allow us to address two questions: 1. To what extent and how were these participants linked together at the start of the experimental trials? 2. What changes in interpersonal linkages took place in the first seven months of the trial period?

The density of a relation is the ratio of the number of reported ties to the total number possible. Table 1 shows the densities for the four relations studied here. Initially, only 62 percent of the participants were linked by having heard of one another. And, at the same time, less than 50 percent of these pairs report having met.

Table 1. Density for four relations over two times

Relation	TIME	
	First	Second
heard of	.62	.77
met	.49	.68
friends	.14	.22
close friends	.05	.06

These results say something about the effects of brief contact, since 21 of these 29 people had just attended a day-long conference in Pennsylvania immediately before taking the questionnaire. It supports the notion that, as Killworth and Bernard (2) have suggested, actual social contacts and reports of these contacts are often quite different phenomena.

The data for the second questionnaire show a considerable amount of consistent change. There were noticeable increases in the proportion of people reporting relationships of all four kinds. It would seem that the computer conference, or perhaps some other events that took place during that seven month period, brought these people closer together.

So far, we can see that the density of ties increased during the period of study, but we can learn more by looking at the pattern of these ties. In order to do that, we must examine some other characteristics of the network. First, we shall consider how close people are to one another.

Reachability in a social network is defined as the condition in which two people are able to contact one another either directly or through intermediaries in terms of some specified relation. Thus, if we were interested in friendship: I can reach my friend, I can reach my friend's friend, my friend's friend's friend and so on. Moreover we can talk of the distance along such a path in terms of the number of links that are necessary for one person to reach another. My friend is at distance 1 from me and his or her friend is at distance 2.

The numbers of reachable pairs and the distances between them in our EIES group are shown in Table 2. The number of reachable pairs is growing wherever possible (there are 812 reachable pairs possible for these data). Moreover, the participants are getting closer together--distances are shrinking--on all relations but one. For close personal friends the second questionnaire shows that, although there are more than twice as many reachable pairs, the average distance between them is increased. Overall, then, this group seems to be drawing together.

For close personal friends, data from the first questionnaire seemed to show the presence of tight little cliques; by the time of the administration of the second questionnaire there were many more personal friends reported and they were beginning to be loosely linked together into larger structures. This suggests that at the end of the second questionnaire there was much more of a "community" among these social networks people.

Table 2. Average distances between reachable pairs and number of reachable pairs for four relations at two times.

Relation	TIME			
	First		Second	
	Distance	No.of Prs.	Distance	No.of Prs.
heard of	1.38	812	1.17	812
met	1.52	812	1.30	812
friends	2.76	728	2.18	812
close friends	2.01	96	3.13	221

We can learn something about inequalities in social choice by looking at the frequencies with which individuals were chosen for each of the relationships. Some kind of stratification is indicated by the tendency for some individuals to be chosen too often and some too seldom. An index of this tendency is given by the variance in the numbers of times individuals were selected as targets for a given relation. In general, the greater the variance, the greater the tendency for individuals to be unequal in being chosen. A large variance suggests that some people are chosen much too much and some too little. Such a tendency toward over- and under-choosing indicates that people are arranged into some kind of hierarchy. In contrast, if the variance is small, we have evidence that the relation being studied is egalitarian. Data on variances of being chosen are shown in Table 3 along with their expected values under the assumption that choices were random.

Data for the first time period show that variance in being chosen decreased markedly with increasing intimacy of relationships. This makes sense. It suggests that the tendency of people to "hear of" one another is highly stratified--participants differed in their prominence prior to their entry into EIES. On the other hand, the choice of "close personal friends" is quite egalitarian--apparently they were chosen without reference to "status."

By the time of the administration of the second questionnaire, however, things had changed considerably. The variances for the less intimate relationships had been reduced, presumably because since most people had gotten to know one

Table 3. Variances, expected variances and ratios of variance to expectation of distributions of number of times chosen for four relations at two times.

Relation	TIME					
	First			Second		
	V	E(V)	V/E(V)	V	E(V)	V/E(V)
heard of	42.9	7.5	5.7	19.0	5.6	3.4
met	23.5	8.1	2.9	20.8	7.2	2.9
friends	9.4	3.8	2.5	20.6	5.2	3.9
close friends	1.3	1.3	.9	2.0	1.7	1.2

another, there was less effect of prior prominence. The increased variance for the more intimate relations, however, suggest that the tendency toward establishing hierarchy has shifted from acquaintanceship to friendship. As these people got to know one another more intimately, it would seem, they began to stratify one another in more intimate terms. There was a shift from stratification in terms of academic status to stratification in terms of personal popularity.

Data in Table 4 on mutual choices can begin to tell us something about how this stratification might work. First of all those data show that the choices are much more predominantly mutual with increased intimacy of relationship. Less intimate relations, then, tend not to be reciprocated, and differences in being chosen probably reflect a stratified hierarchy of individuals.

The predominance of mutual choices for friends and close personal friends, however, tells a different story. For these more intimate relations, any tendency toward stratification probably embodies a tendency to form a hierarchy of clusters of closely tied individuals. Thus, for friends, we seem here to be developing a stratified set of clusters. For close personal friends, since they exhibit even more mutuality of choice, choices probably reflect the development of an increasingly stratified set of tightly knit and unconnected cliques.

Table 4. Number of mutual choices, expected number and ratio of the observed number to its expectation for four relations over two times.

Relation	TIME					
	First			Second		
	M	E(M)	M/E(M)	M	E(M)	M/E(M)
heard of	204	155.9	1.3	276	243.3	1.1
met	167	98.9	1.7	236	189.1	1.3
friends	33	8.4	3.9	53	19.3	2.7
close friends	12	.9	13.3	18	1.5	12.0

Discussion of Results

Overall, these data reveal some systematic changes in relationships among these people. They are both more aware of one another and more willing to claim ties of friendship. Pairs of people are closer together and fewer individuals are isolated. There are increased numbers of mutual choices and the patterns of stratification are switching from individual hierarchies to hierarchies of clusters. The data suggest a general pattern of increased density and structural organization of relationships.

These observed changes in patterns of personal ties are particularly interesting in this context because, unlike those observed in other longitudinal sociometric studies, the participants here had very little face-to-face contact during the study period. Most of their contacts were computer-based.

It is difficult to tell how many of these changes are due to the EIES experience, and how many have resulted from other events that took place during the same time period. Anecdotal data can throw some light on this matter. Reports from participants reveal that on at least four occasions during the course of this project friendships were formed between pairs of persons who had never met face-to-face. In one case a pair of people agree that they have developed a close personal friendship while using the EIES system.

In general, however, individual subjective reports seem to suggest that EIES is more useful as an adjunct to personal contact than as a substitute. For a pair of people who have actually met, electronic communication seems to be able to provide an adequate medium for the sort of frequent interaction that is needed in building up a friendship. Moreover, people who are on the road to becoming friends electronically are probably more likely to agree to attend the same face-to-face conferences and more aware of one another if they do. Many of our participants report a sense of "kinship" with other EIES people when they meet at a conference.

Participants suggest that when they do meet and develop some effectual ties they can maintain contact by using EIES. At this point, then, the subjective data seem to suggest that although EIES can be used in the creation and support of more intimate relationships, it is probably best conceived--in this context--as an adjunct to more traditional sorts of interpersonal contacts.

#### Summary and Conclusions

The overall results in this study show marked changes in patterns of linkages between the two waves of data collection. Participants got closer together and the initial patterns of stratification seemed to shift in form. Not only did participants "meet" via the computer, but there were noticeable increases in the extent of more intimate personal links between them.

Taken as a whole, the results were very much like those one might observe in a group of people brought together in a common physical location for an extended period of time. It is tempting, therefore, to conclude that computer-based communication can substitute for face-to-face interaction. Of course, such a conclusion cannot be drawn. Although this is a comparative study, it is not experimental. The confounding effects of history, maturation, testing and instrument decay described by Campbell (3) all compete with the computer experience as explanations of observed differences.

We do, however, have enough anecdotal information to suggest that the computer conference itself had an impact on the structure of this group. It is not unreasonable, then, to end with the conclusion that computer conferencing does seem to provide the sort of experience that can affect patterns of interpersonal linkages. Not only can participants exchange information, but they seem to be able to exchange friendship as well.



References

1. Mullins, Nicholas C. *Theories and theory groups in contemporary american sociology*. New York: Harper and Row; 1973.
2. Killworth, Peter; Bernard, H. Russell. Informant accuracy in social network data. *Human Organization*. 35: 269-286; 1976.
3. Campbell, Donald T. Factors relevant to the validity of experiments in social settings. *Psychological Bulletin*. 54: 297-312; 1957.