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ABSTRACT

This paper investigates the formation and evolution of friendship cliques among preadolescent youths. An understanding of these patterns can aid teachers in influencing social relations and the behavior of their students. Two sets of sociometric data were collected to analyze children's friendship cliques. The relationship among the variables of class size, classroom organization, grade, and sex was examined in a cross-sectional data set of 51 groups and a longitudinal data set of 11 groups. Class size and organization were found to have an effect on average number of friends and on the number, size, and stability of cliques. Fewest children excluded from cliques were found in the sixth grade. While some cross sex friendships were reported, a total sex cleavage existed between boys' and girls' cliques in every class. Data, research methodology, findings, and statistical tables are included in the report. (Author/KC)

THE DEVELOPMENT OF CHILDREN'S FRIENDSHIP CLIQUES[1]

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The major studies dealing with the friendship cliques of youth concentrate on the friendships of adolescents (e.g., Hollingshead, 1949; Gordon, 1957; Coleman, 1961; Whyte, 1967; Cusick, 1973). These studies are primarily case histories that identify cliques by observation and describe characteristics of their members. The setting is generally a single school or neighborhood. Often one clique is followed over a period of time to determine its longevity and to observe the stability of its membership.

Numerous studies on the friendships of pre-adolescents may be found in the literature but these seldom deal with children's cliques. They aim rather to identify sociometric stars and social isolates, to detect the number of cross sex or cross racial friendships in a class (Moreno, 1953; Gronlund, 1959; Glidewell, 1966; St. John and Lewis, 1975), and to relate correlates of personality characteristics to popularity (Zander and Van Egmond, 1963; Hargreaves, 1972). Most of this research is based on cross-sectional sociometric data and often includes only a single class in the analysis. The few studies of children's cliques that do exist (Gronlund, 1959; Moreno, 1953) are also cross-sectional and rely on the visual analysis of data to detect cliques.

Research on the friendship cliques of preadolescents is important for several reasons. In the first place, peers play a major role in the formation of a child's attitudes, values, and social behavior (Coleman, 1961; Rigsby and McDill, 1972; Cusick, 1973). To know a child's friends and the norms and values they hold provides significant information about the influences to which the child is exposed. Secondly, knowledge of clique membership has pedagogical value (Coleman, 1960). Peer group instruction and group projects may sustain student interest in learning to a greater degree than instructional techniques

that ignore the social system of the classroom. Finally, the formation of students' friendship cliques is likely to be affected by manipulatable variables such as classroom environment and organization. An understanding of the effect of these variables on clique formation and stability enables teachers to influence the social relations and behavior of their students.

Several factors are believed to affect the formation and evolution of children's cliques. Among these are propinquity and similarity. The effect of propinquity, which has been examined in several studies (Newcomb, 1961; Campbell, 1964; Hargreaves, 1972), is straightforward. When two persons are near each other, they have more opportunities to interact and are more likely to become friends (Homans, 1950). Classroom variables, such as physical arrangement and grouping schemes, constrain the proximity of students resulting in some children's being placed together more frequently than others. This increases the chance that they become friends and form a clique.

Similarity (of attitudes, values, interests) increases friendliness by providing a child with a basis for approving another (Newcomb, 1956), by helping the child to validate his social identity (Schachter, 1959), and by reducing areas of conflict among children (Sherif, et. al., 1961). Children who are similar in characteristics that they perceive to be relevant are likely to become friends. Similarity of sex, race, age, and achievement are among the factors children seem to consider in selecting friends (Tuma and Hallinan, 1977).

The aim of the present paper is twofold: (1) to describe properties of children's friendship choices at a point in time and relate these pro-

perties to characteristics of the students and their classroom environment and (2) to identify patterns in the evolution of children's cliques over a school year and relate these patterns to student and classroom characteristics. To achieve these ends, we will employ a method of detecting cliques (Alba, 1972) that is more appropriate than the methods typically used in friendship studies.

The Data

Two sets of data were collected to analyze children's friendship cliques. The first set consists of cross-sectional sociometric data from 51 classes; the second contains sociometric data collected from 11 classes at several time points over a school year. The children in the sample were given a list of their classmates and asked to indicate whether each classmate was a best friend, a friend or someone they knew but did not consider a friend. They were allowed to designate as many or as few names in each category as they wished. This free choice sociometric technique is designed to minimize measurement error (Hallinan, 1974; Holland and Leinhardt, 1973). The analysis discussed in this paper was performed on the best friend data since the impact of cliquing is believed to be greatest when clique members are close friends. Moreover, the children in the sample tended to include most of their classmates as friends; this made an analysis on the friend level less meaningful.

The cross-sectional data on the 51 groups came from 14 private and public elementary and junior high school students in grades 5 through 8. Based on the Walberg and Thomas (1972) scheme, 12 of the classes were designated as open, 25 as semi-open and 13 as traditional. The open classes were characterized by frequent opportunities for student interaction and decision making. Students in the semi-traditional classes had some opportunities for interaction while those in the traditional classes had only limited and infrequent occasions for interaction and decision making. The classes ranged in size from 10 to 35 with a mean size of 20.9 and standard deviation of 7.3.

The longitudinal data were obtained from 4th, 5th, and 6th grade children in seven public and private elementary schools. Four of the classes were classified as open, three as semi-traditional and four as traditional. The classes ranged in size from 18 to 60 with a mean size of 31.8 and a standard deviation of 12.0. The data were collected from four of the classes at exactly six week intervals. In the remaining seven classes, the data were gathered at approximately five to seven week intervals. The number of data collections for the classes varied from six to eleven, depending on the length of the time intervals between collections. Alpha-numeric codes were assigned to the classes; the letters T (traditional), S (semi-traditional) and O (open) represent the classroom organization and the number stands for the grade level. Groups with the same code were differentiated by adding the letters A or B.

Methodology

The definition of clique most frequently found in the sociometric literature states that a clique is a maximal complete, strongly connected subset of elements (Luce and Perry, 1949).[2] One advantage of this definition is that it gives a formal specification of the properties of a clique and allows no ambiguity in the identification of its membership. However, the requirement that a subgroup be strongly connected is a stringent one. It excludes some subgroups that an observer would consider highly cohesive. Other methods of detecting cliques that rely on less formal definitions (Coleman and MacRae, 1960; Hubbell, 1965; Doreian, 1969; Peay, 1974) have the disadvantage of requiring subjective judgments about the boundaries of cliques and their membership. These methods are less useful for comparing clique structures across groups.

Alba (1972) recently devised a set of procedures for sociometric clique identification that are intended to improve on previous methods. His techniques permit one to weaken Luce and Perry's definition of clique in a number of ways. In the present study we utilized Alba's computer program COMPLT to identify subgroups based on a modified definition of clique.

Cliques were selected by the following procedure. First, the maximal complete, strongly connected subgroups of size four or larger were obtained. These subgroups satisfy Luce and Perry's definition of clique. Subgroups of size two or three were excluded because they are not ordinarily regarded as cliques. The second step was to merge all of the subgroups that contain two thirds of their members in common. This number is arbitrary. It imposes a somewhat rigid requirement and was selected to insure that the aggregated subgroups would be highly cohesive. The new subgroups formed in the manner are no longer complete. For example, for two subgroups of size four to be merged, three of the members must be contained in both subgroups. The remaining fourth members are not connected. Similarly, for two subgroups of size five to be merged, four of the members must overlap while the fifth members in each subgroup will not be connected. These aggregated subgroups, as well as the maximal complete subgroups that could not be merged, are classified as cliques. Some, but not all of the cliques, satisfy Luce and Perry's definition while all of them are highly cohesive.

Findings

The first stage of the analysis is to describe properties of the friendship choices of children in both data sets and to relate these properties to characteristics of the children and their classroom environment.

The means and standard deviations of the number of best friend choices given and received was calculated for the cross-sectional and longitudinal data sets.[3] The mean number of best friend choices averaged over the 51 groups is 5.16 with a standard deviation of 1.6 across the groups. The standard deviations of the number of choices given and received were calculated separately for each class and averaged over the 51 groups. These statistics are 2.67 and 2.71 respectively for the choices given and received. The mean number of choices for the 11 groups averaged over time is 5.44 with a standard deviation of 1.41. The standard deviations of the number of choices given and received averaged over time and across the 11 classes are 3.07 and 2.72 respectively. These figures show that the average child in our sample chooses about five best friends, although considerable variance exists in the number of choices given and received in both data sets. The typical range of best friend choices given and received is approximately two to eight.

To determine whether the number of friends a child chooses is related to the number of friendship choices he receives, we calculated the zero order correlation coefficient between the number of choices given and received. The average correlation for the 51 groups is .11. Five of the 51 correlation coefficients were significant at the .05 level. The mean correlation coefficient averaged over time and across the 11 groups is .24. Four of the 11 average values of r were significant. No effects of class size, grade level or classroom organization were found on the size of this correlation. The results show that no relationship exists between the average number of friends a child chooses or the number he is chosen by in most of the classes in the sample. Based on these findings it seems that the popularity of a child cannot be explained

in terms of that child's tendency to select a large number of friends.

The relationship between classroom size and the number of choices given and received was examined by correlating these two variables in both data sets. The mean class size for the 51 groups is 21 with a standard deviation of 7.3; for the 11 groups, the mean is 32 with a standard deviation of 12.0. The zero order correlation between size and number of choices for the 51 groups is .64 ($p < .05$); for the 11 groups it is .31 ($p < .05$).[4] Thus children in our sample who are in large classes give and receive more choices on the average than those in smaller classes. This relationship can also be examined by subdividing the sample by size of class and comparing the choice means. Table 1 presents the statistics for both

(Table 1 about here)

data sets. The children in large classes choose more best friends and are chosen more frequently as best friend than the children in smaller classes. An obvious explanation for this finding is that larger classrooms provide a larger pool from which a child can select his friends. This increases the likelihood of finding classmates who possess the characteristics a child is looking for in a best friend. While large classrooms are generally regarded as a deterrent to learning, our results suggest that large classes may have an advantage in terms of the students' affective growth and development. The result also reveals the need to control for size in examining the relationship between other variables and friendship choices.

Two characteristics of children generally believed to influence their friendships are age and sex. As children grow older they acquire greater social maturity and awareness and are likely to be more selective in choosing

their friends. Therefore, one would expect the number of friendship choices to decrease with age and grade. Table 2 presents the means and standard

(Table 2 about here)

deviations of the number of best friend choices given and received for the two data sets by grade. In the 51 groups, the 8th graders selected the smallest number of friends, as predicted. In the longitudinal data the number of friends increased with grade although the sample size is too small to make inferences. Overall, the data show a tendency toward a curvilinear relationship between grade and number of best friends with the maximum number of friends being chosen in the 6th and 7th grades. However, a t-test shows no significant differences among the means in either data set. Further research is needed to determine whether the trends showed here are pervasive characteristics of children's friendships.

An examination of the effect of sex on the number of best friends was possible only in the longitudinal data set since information on the sex of students in the cross-sectional data set was not available. Table 3 compares

(Table 3 about here)

the number of best friends chosen by sex. A t-test shows significant differences in the number of choices given in four of the eleven groups. Boys selected fewer best friends than girls in three of the four cases. Significant differences in the number of choices received by other classmates were obtained only twice; girls received fewer choices than boys once and boys received fewer choices than girls once. In general, girls gave more choices than boys six out of eleven times and girls received more choices

than boys seven out of eleven times. In noting these results, it is important to consider the relative number of boys and girls in each class. Most of the significant differences observed can be explained in terms of group size. For example, while boys received over twice as many choices as girls in group T5, there were twice as many boys as girls in that class. Consequently, the data seem to show no difference between boys and girls in the number of best friends they choose and are chosen by.

Also of interest in investigating the effect of sex on friendship is the number of cross sex choices in the class. The last column of Table 3 gives the number of cross sex choices given as a percentage of the total number of choices given in the class averaged over time. The percentages are generally small, consistent with the sex cleavage often observed in elementary school classes. The number of cross sex choices is inversely proportional to grade. The average percentage in fourth, fifth, and sixth grade classes are 14%, 12% and 6% respectively. The sex cleavage is greatest in sixth grade. Children at this age are on the brink of puberty and may need to dissociate from the opposite sex almost completely in order to establish their sexual identity. It is surprising to find that in two of the classes with large size differences, one a traditional fourth grade class and the other an open fifth grade class, over 30% of the choices are given to members of the opposite sex. This result is not easily explained in our data and is likely attributable to a classroom variable we have not measured. It is, however, consistent with results obtained in an earlier study (Hallinan and Tuma, 1977; Tuma and Hallinan, 1977).

The relationship between classroom organization and friendship choice

is given in Table 4. In both the cross-sectional and the longitudinal data,

(Table 4 about here)

more best friend choices are given (and received) in the traditional classes than in the semi-traditional and open classes. A t-test shows that the traditional classes have significantly more best friend choices given and received than the open classes ($p < .05$). The traditional classes also vary more in the number of choices given and received. Therefore, the traditional classes have a more hierarchized distribution of choices given and received than the open classes. This implies that traditional classes contain more very popular and more very unpopular children than open classes. The encouragement of student interaction in open classrooms and the wide variety of tasks in which students are engaged are apt to increase each child's chances of making some friends and decrease the likelihood that one or two children would win a disproportional number of friendship choices. These results do not appear to be due to size, especially in the 51 groups where the size differences are negligible.

Next, we examined the effect of classroom organization on the incidence of social isolates, that is, on the number of children in each class who received no best friend choices. Table 5 gives the average number of social

(Table 5 about here)

isolates in each class by classroom organization. Fewer social isolates are found in the traditional classes than in the open classes in both data sets although the differences are small. These results do not contradict the finding that traditional classes are more hierarchized than open classes

since hierarchization need not imply the presence of social isolates. The findings merely suggest that classroom structure may affect social isolation. Of greater interest in these data is the distribution of social isolates by grade. The average number of isolates in grades 6 through 8 in the 51 groups is .33, .47 and 1.07 respectively and in grades 4 through 6 in the 11 groups is .63, .82 and .36 respectively. These figures show an inverse curvilinear relationship between number of social isolates and grade. Children seem better integrated into the friendship structure of the classroom in the sixth grade than in any other grade.

The density index measures the extent to which group members are linked to each other through friendship. It is obtained by dividing the number of choices made by the number of possible choices. Table 6 shows the density

(Table 6 about here)

statistics by classroom organization and by grade. Traditional classes are more dense than semi-traditional or open classes which is consistent with the earlier finding that traditional classes contain a higher incidence of friendship choices. The friendship networks in the sixth grade classes are denser than in any other grade. This result, as well as the earlier finding that sixth grades have the greatest number of friendship choices and the fewest social isolates, indicates that children at this grade level are expansive in their within sex social relationships and are likely to form tight knit cliques.

We also note that the density of most of the groups exhibits a curvilinear relationship with time. This pattern is most pronounced in the open classrooms. The data show that children tend to choose more friends,

in general, as the school year progresses but then withdraw some of those friendships toward the end of the year. From a social network perspective, the number of ties or linkages connecting the group members is greatest after mid-year but decreases slightly toward the end of the year. Interaction patterns and the diffusion of information among the students are likely to vary with the density of the friendship network.

In summary, the analysis showed the following results: (1) the typical child had approximately five friends; (2) no significant relationship was found between the number of best friends one chooses and is chosen by; (3) children in large classes gave and received more best friend choices than children in smaller classes; (4) no significant relationship was found between grade and number of best friend choices although a tendency toward a curvilinear relationship was observed; (5) children did not differ by sex in the number of their best friendships; (6) relatively few cross sex friendships were observed in any grade; (7) a larger number and more hierarchized distribution of best friend choices were found in traditional classes than in semi-traditional or open classes; (8) traditional classes tended to contain fewer social isolates than less structured classes; sixth grades contained fewer social isolates than any other grade; and (9) the friendship network was most dense in traditional classes and in sixth grade classes.

Cliques

The second part of the analysis focuses on the formation and evolution of children's friendship cliques over the school year. We first examine

the incidence of cliques in the cross-sectional data. Table 7 shows the

(Table 7 about here)

number and average size of the cliques in the sample of 51 groups by size of class, grade and classroom organization. Twenty-two classes out of 51 contain one or more cliques.[5] Over half of the classes have no cliques at all, which is noteworthy because we ordinarily assume children form friendship cliques. The low incidence of cliques in our sample may point to a major difference between children's and adolescents' groups.

Of the 22 classes which do have cliques, the number of cliques per class ranges from one to five. The average size of the cliques is approximately five members. This figure does not seem to be influenced by class size, grade or classroom organization. Large classes have a tendency to have more cliques, as might be expected. The sixth grade classes have more and slightly larger cliques than the seventh and eighth grades. This is consistent with the earlier finding that sixth grades have fewer social isolates and a denser configuration of choices. Open classes have fewer and smaller cliques than more structured classes, probably because of the freer interaction in open classes discourages the formation of exclusive subgroups.

Tables 8 shows the development of cliques over a school year in the 11

(Table 8 about here)

classes. The number of cliques per class varies considerably across the time intervals. This result suggests caution in making inferences about friend-

ship structure based on cross-sectional data alone. Table 9 summarizes some

(Table 9 about here)

of the data in the preceding table. It shows the total number of cliques that appeared in each class over the school year by size of class, grade and classroom organization. These findings are similar in a number of ways to those reported in Table 7 for the cross-sectional data. On the average, larger cliques are found in larger classrooms, as expected. Cliques in the sixth grade are considerably larger than in the other two grades. In the 51 groups, the sixth grade cliques are larger than those in the seventh and eighth grades. These results suggest the existence of tight friendship networks in sixth grade classes. Finally, the cliques in the open classrooms are considerably smaller than those in the semi-traditional and traditional classrooms, again probably because freedom of interaction results in less exclusive friendships.

Table 8 illustrates a complete sex cleavage in all of the classes in the sample over the entire school year. A member of the opposite sex is never included in a friendship clique. While a sex cleavage has been reported previously in cross-sectional studies, the present results show the extent of this cleavage over time, across grades and across classroom organization. Not even in open classrooms where students are encouraged to interact and work together on joint activities do boys and girls include members of the opposite sex in their cliques. It is also interesting to note that a sex cleavage occurs as early as the fourth grade and that sixth graders have not yet reached the level of social maturity to be able to transcend sex as a barrier to friendship. While Table 3 showed that a small

number of cross sex friendship choices occur in some classes, children appear reluctant to include members of the opposite sex in their cliques, perhaps because the group norm is stronger in this regard. This distinction, between choosing members of the opposite sex as friends or as clique members, is seldom made but is important for an understanding of children's social behavior.

In an earlier analysis (Table 5), we examined the incidence of social isolates in children's friendship groups. Children can also be isolated by being excluded from the friendship cliques in the class even though they may have some friends. This type of social isolation is seldom studied but deserves attention because it is likely to be as distressful to some children as the absence of friends is to others. Table 10 shows the

(Table 10 about here)

number of boys and girls in each class by grade that did not belong to a clique at any point during the school year. These figures vary considerably across groups. The fewest children are excluded from cliques in the sixth grades. In these classes, not being a clique member places a child in a small minority of students. Being singled out in this way can cause the child considerable psychological harm. Both boys and girls are excluded in all four classes. In the lower grades a larger number of children are excluded from cliques making the designation less obvious and possibly easier for a child to accept.

Table 8 also shows that the children who are isolated from cliques are, in general, those who receive the fewest friendship choices. However, children who give the fewest number of friendship choices are not necessarily excluded from cliques. On the other hand, students who receive most friend-

ship choices, that is, the sociometric stars, are usually clique members although there are some notable exceptions as, for example, student 22 in T4 who receives 10.7 choices. While sixth graders choose a large number of friends, they also discriminate against some children. They exclude from their cliques both members of the opposite sex and certain other children who probably lack the characteristics they find attractive or who violate group norms in some way. These results suggest that clique membership has high status in the classroom and that cliques are likely to include and probably center around the most popular children. Unpopular, as well as moderately popular, children are excluded from these friendship groups.

Finally, we examine the stability of cliques over the school year. A clique is stable if it retains at least some of its membership for the entire year. Clique B in T6 is stable because it includes students 20, 21 and 26 at every point in time. The fact that the other students join and leave the clique does not destroy its identity as a subgroup and hence its stability. Table 8 shows that only 6 of the 34 cliques represented were stable over time. However, several other cliques were stable for most of the school year. Some cliques emerged and disappeared sporadically over the year as, for example, clique Y in T6. This disappearance of a clique for a short time may be an artifact of the definition of clique employed in the analysis; a weaker definition might show the cliques to be more stable. Other cliques formed after the beginning of the school year and, once established, remained stable for the remainder of the year, for example, clique X in T6 and clique X in S6A. Still other cliques were absorbed by already existing cliques; for example, clique Y in T6 is incorporated into clique X and clique A in S6B joins clique B. In general, the cliques exhibit

considerable continuity as recognizable subgroups over the school year.

In examining the effect of grade on clique evolution, we see that the most stable cliques are found in the sixth grade classes. Five of the six cliques that are stable throughout the entire year are in the sixth grade (classes T6, S6B, 06). The sixth is in a fifth grade (T5). Two of the cliques in the remaining sixth grade (S6A), cliques X and B, are stable for all but one time period, the first and last time interval respectively. These results indicate that sixth grade might be the age at which children begin to form the kinds of stable, tight knit and exclusive cliques found among adolescents. It was also seen to be the age at which sex cleavage is the strongest. Class size and classroom arrangement organization apparently have no effect on clique stability although these relationships need to be studied further on a larger sample.

Examining the membership of the cliques over time reveals more change in total membership than in the existence of the cliques themselves. Most clique members seem to leave the clique at some point in time and many rejoin at a later time. This instability may be due to the rigid definition of clique; it is likely that most students who appear in a clique at several time points remain friendly with the other clique members during the occasional time intervals when they don't appear as members. An exception might be the case where a student belongs to a clique early in its life, leaves and never reappears in the clique. Examples are students 13 and 26 in S6A and student 6 in T6. If we interpret an occasional absente of a student from a clique as an artifact of the definition of clique, then the data indicate that the membership of cliques remains fairly constant over time and that students who join a clique are likely to remain in it throughout the school year.

Conclusions

This study showed several patterns in the formation and evolution of children's friendship cliques. The incidence of cliquing among the pre-adolescents in the sample was considerably less than anticipated; about half of the classes studied contained no cliques at all. The cliques that did form were somewhat stable over the school year although a number of students in each class left and rejoined the cliques at different times. Sex cleavage in the cliques was total. The findings indicate that cliquing begins to appear at the elementary and junior high school level but is not strong until adolescence is reached.

Characteristics of individual children and of their classroom settings were found to affect the number of friendships in the class and the number and size of the cliques. Large classes contained more friendships and more cliques than smaller classes, as might be expected. Children in open classes received fewer friendship choices than those in more structured classes but the choices were more evenly distributed in the open settings. The freer interaction in open classrooms may encourage children to get to know each other better and, as a result, to come to like classmates who otherwise might go unnoticed. At the same time, children who would be sociometric stars in traditional classrooms may be less visible in open classrooms and therefore receive fewer friendship choices. Sixth graders had more friends than children in other grade. This grade level also showed fewer cross sex choices, fewer social isolates and larger cliques. In our sample, children's behavior seems to become more social from the fourth through the sixth grade. Friendships in the seventh and eighth grade decrease in number and in structure, possibly because this is a period of uncertainty and transition

to adolescence. Understanding the effect of classroom variables, such as size, classroom organization and grade level on children's friendship patterns, provides a valuable way to foster healthy friendship relations.

Finally, we examined the incidence of two kinds of social isolates: the child who has no friends in the class and the child who is excluded from the friendship cliques. Nearly every class contained some children who had no friends. The number was smallest at the sixth grade level, probably because of the tendency of sixth graders to choose many friends. More pronounced was the occurrence of children isolated from the friendship cliques in the classroom. The number of children excluded from cliques varied considerably across the sample with little relation to the exogenous variables. The negative effect of this kind of isolation on a child's self-image is likely to be greatest in classes where most class members belong to cliques. In these classes intervention might be required to alter the social system in such a way as to integrate isolated children.

This study shows that elementary and junior high school children engage in social behavior that models in a modest way the friendship patterns of adolescents. A tendency toward the formation of friendship cliques was found as well as a tendency toward stability in existing cliques. In contrast to adolescent groups, a large number of classes contained no cliques at all. Moreover, no example of the disintegration of cliques was found. The data suggest that preadolescence is a time in which children are learning the kinds of group oriented and often exclusive social behavior that characterizes older youth.

FOOTNOTES

2. A subset is strongly connected or strong if every two elements are mutually reachable.

3. The average number of choices given in a class is the same as the average number of choices received, although the distributions of the two sets of choices are likely to be different. When the number of choices is obtained for each sex, the mean number of choices given differs from the mean number received for each sex because the cross sex choices are included.

4. For the 11 groups, size was correlated with the mean number of choices given in each class averaged over the several time intervals.

5. If a weaker definition of clique were used, some of the subgroups appearing as separate cliques might merge into one larger clique; for example, in T6, cliques A and B and cliques X and Y might join. It would be useful to reanalyze the data using alternate definitions of clique to see if the properties observed in this study are retained.

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Table 1. Average means and standard deviations of number of best friend choices given and received for cross-sectional (N=51) and longitudinal (N=11) data sets by size of class

Class Size	Mean	S.D. of # Choices Given	S.D. of # Choices Received
51 Groups			
Large (25-35) (N=17)	6.52	3.42	3.27
Medium (20-24) (N=16)	4.73	2.66	2.56
Small (12-19) (N=18)	3.99	2.02	2.32
11 Groups			
Large (27-60) (N=7)	6.12	3.72	2.92
Small (19-26) (N=4)	4.65	1.92	2.29

Table 2. Average means and standard deviations of number of best friend choices given and received by grade for cross-sectional (N=51) and longitudinal (N=11) data.

Grade	$\bar{X}$	S.D. of # Choices Given	S.D. of # Choices Received
51 Groups			
8 (N=16)	4.89	2.50	2.74
7 (N=17)	5.62	2.80	2.89
6 (N=18)	5.14	2.72	2.58
11 Groups			
6 (N= 4)	6.46	2.37	2.91
5 (N= 3)	5.44	4.71	2.52
4 (N= 4)	4.43	2.57	2.42

Table 3. Average means and standard deviations of number of best friend choices given and received over time by sex and percentage of cross-sex choices for longitudinal data (N=11).[1]

	# Choices Given				# Choices Received				
	MALE		FEMALE		FEMALE		MALE		% Cross-
Class	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	Sex Choices[2]
T6	8.08	(3.57) (N=12)	5.26	(2.63) (N=14)	6.80	(2.61)	5.15	(3.54)	11%
T5	8.53	(5.60) (N=23)	3.48*	(2.29) (N=12)	8.44	(3.13)	3.38*	(2.08)	2%
T4	4.31	(3.30) (N=12)	5.97	(3.12) (N=16)	4.78	(1.98)	6.22	(3.40)	32%
									$\bar{X}$ = 15%
S6A	5.40	(1.87) (N=10)	8.54*	(1.71) (N=18)	5.26	(2.33)	8.58*	(3.82)	5%
S6B	6.75	(1.85) (N=10)	6.29	(2.10) (N=19)	6.37	(0.80)	6.50	(2.30)	2%
S5	4.85	(3.75) (N=30)	6.09	(4.09) (N=30)	5.15	(2.25)	5.82	(2.41)	4%
S4	6.00	(5.55) (N=30)	5.10	(3.91) (N=16)		(3.23)	5.58	(2.03)	16%
									$\bar{X}$ = 7%
06	4.96	(2.04) (N=13)	5.75	(1.84) (N=14)	5.25	(2.94)	5.50	(2.61)	5%
05	2.64	(1.13) (N=10)	4.53*	(1.23) (N= 9)	2.89	(1.94)	4.32	(1.77)	31%
04A	5.29	(1.50) (N=14)	4.95	(1.22) (N=11)	5.29	(1.37)	4.86	(2.06)	3%
04B	2.65	(1.10) (N=11)	3.73*	(1.90) (N=10)	2.58	(1.55)	4.14	(2.51)	6%
									$\bar{X}$ = 15%

* The difference between the means for boys and girls is significant ($p < .05$).

[1] The means and standard deviations are averaged over the several data collections for each class.

[2] The percentage is calculated by dividing the number of choices given to members of the opposite sex by the total number of choices given in the class.

Table 4. Average means and standard deviations of number of best friend choices given and received by structure of class in cross-sectional (N=51) and longitudinal (N=11) groups by classroom organization.

51 Groups

Class Organization	$\bar{X}$	S.D. of # Choices Given	S.D. of # Choices Received	Class Size
Traditional (N=13)	6.39	3.19	3.16	23.6
Semi-traditional (N=25)	4.95	2.57	2.69	21.1
Open (N=13)	4.32	2.29	2.29	22.1

11 Groups

Traditional (N=3)	6.41	3.51	3.41	30.8
Semi-traditional (N=4)	5.97	4.43	2.48	45.3
Open (N=4)	4.34	1.60	2.14	22.8

Table 5. Average number of social isolates by classroom organization for cross-sectional (N=51) and longitudinal (N=11) data.

51 Groups		11 Groups	
Classroom Organization	Average # Social Isolates	Classroom Organization	Average # Social Isolates
Traditional	0.31 (N=13)	T6	0.57
		T5	0.50
		T4	0.64
		$\bar{X}$ =	0.57
Semi-traditional	0.44 (N=25)	S6A	0.29
		S6B	0.29
		S5	1.21
		S4	0.29
		$\bar{X}$ =	0.52
Open	0.69 (N=13)	06	0.29
		05	0.75
		04A	0.36
		04B	1.25
		$\bar{X}$ =	0.66

Table 6. Average density by classroom organization and by grade for cross-sectional (N=51) and longitudinal (N=11) data

51 Groups

Classroom Organization	Density	Grade	Density
Traditional (N=13)	.285	8 (N=16)	.243
Semi-traditional (N=25)	.250	7 (N=17)	.242
Open (N=13)	.219	6 (N=15)	.269

11 Groups

Classroom Organization	Density	Grade	Density
Traditional			
T6	.260	6 (N=4)	.242
T5	.198		
T4	.183		
$\bar{X}$	.214		
Semi-traditional			
S6A	.275	5 (N=3)	.173
S6B	.225		
S5	.096		
S4	.127		
$\bar{X}$	.181		
Open			
06	.208	4 (N=4)	.177
05	.225		
04A	.213		
04B	.183		
$\bar{X}$	.207		

[1]The density index for the longitudinal data is averaged over the several time points.

Table 7. Number and size of cliques by size of class, grade and classroom organization for cross-sectional (N=51) data

Size of Class	# Classes with Cliques	# Cliques in Each Class	Mean Size and S.D. of Cliques
Large (25-35) (N=17)	10	1,1,3,4,4,4,5,5,5,5	5.65 (1.49)
Medium (20-24) (N=16)	8	1,1,1,2,2,2,3,4	5.50 (1.55)
Small (12-19) (N=18)	4	1,2,3,5	5.27 (1.19)
Grade			
8 (N=16)	6	2,2,3,3,4,5	5.21 (1.08)
7 (N=17)	7	1,1,3,4,4,5,5	5.74 (1.71)
6 (N=18)	9	1,1,1,1,2,2,2,4,5	5.79 (2.25)
Classroom Organization			
Traditional (N=13)	9	1,1,2,4,4,4,5,5,5	5.77 (1.73)
Semi-traditional (N=25)	9	1,1,1,2,2,2,3,3,4	5.11 (0.99)
Open (N=13)	4	1,2,3,5	5.27 (1.19)

Table 8.1. Incidence of cliques and number of best friend choices given and received by classroom organization for longitudinal (N=11) data.[1]

Student Code	CLASS T6 (N=26) Time 1	2	3	4	5	6	7
Male (N=11)							
1	B		B	B	A	B	A
2	B	B	B	B	A/B	B	A
3				B	A	B	A/B
4	B	B	B	B	A/B	B	A/B
5	B	B	B	B	A/B	B	A/B
6	B	B	B	B	B	B	A/B
7	B			B	B	B	B
8		B		B	B		B
9				B	B	B	
10						B	
11	(Not in clique)						
Female (N=15)							
12		Y		X/Y	X	X	X
13		X/Y	X	Y	X	X	
14		X		Y			X
15		X/Y	X	X		X	
16		X/Y	X	X/Y		X	X
17		Y					
18		X	X	X	X	X	X
19		X	X	X		X	
20					X		X
21							X
22							X
23-26	(Not in cliques)						

[1] The student codes were renumbered to place the clique members before the nonclique members.

Table 8.2.

CLASS T5 (N=35)

Student Code	Time 1	2	3	4	5	6	7	8	9
Male (N=23)									
1				A/C	A				
2	A	A	A	A/C	A	A	A	A	A
3	A	A	A/D	A/C/D	A	A	A	A	A
4	A	A	A/D	A/C/D	A	A	A	A	A
5			D	C/D	A	A	A	A	A
6	A		A	A	A	A	A	D	A
7		A	A	A/D	A	A	A	A	A
8			A	A	A	A	A	D	A
9			D	D				A/D	A
10	A	A	A	A/B	A	A	A	D	A
11	A	A	A	A/B	A	A	A	A/D	A
12				B	A	A	A	A/D	A
13			A	A/B	A				A
14				A/B			A		A
15				B			A		A
16				A	A	A	A		A
17					A	A	A	A	A
18					A	A		A	A
19				A			A		A
20-23	(Not in cliques)								
Female (N=12)									
24			X	X		X		X	X
25			X	X		X		X	X
26			X	X		X		X	X
27			X	X				X	X
28				X		X		X	X
29-35	(Not in cliques)								

Table 8.3.

CLASS T4 (N=28)

Student Code	Time 1	2	3	4	5	6	7	8	9
Male (N=12)									
1-12	(Not in cliques)								
Female (N=16)									
13	X	X						X	
14	X	X							
15	X	X						X	
16	X	X						X	
17		X							
18								X	
19-28	(Not in cliques)								

Table 8.4.

CLASS S6A (N=28)

Student Code	Time 1	2	3	4	5	6	7
Male (N=10)							
1		B	B	B	A/B	B	
2		B	B	B	A/B	B	
3	B	B	B	B	A/B	B	
4	B	B	B	B	A/B	B	
5	B	B	B	B	A/B	B	
6	B	B	B	B	A/B	B	
7		B	B	B	A/B	B	
8		B	B	B	A/B	B	
9		B	B	B	A/B	B	
10			B	B			
Female (N=18)							
11		Y/Z				X	X
12		X/Y/Z	X	X	X/Y	X	X
13		X/Y/Z	X	X	X/Y/Z	X	X
14		X/Z	X	X	Y	X	X
15		X/Y/Z	X/Z	X	X	Z	X/Z
16		X/Y/Z	X/Z	X	X/Y	X/Z	X/Z
17		X/Y/Z	X	X	X/Y	X/Z	X/Z
18		X/Y/Z	Z		X/Z		Z
19		X/Y/Z	X/Z		X	Z	Z
20		X/Y/Z	X	X	Y/Z		
21		X/Y/Z					
22		X/Y/Z	Z	X	X	Z	Z
23		X/Y/Z	X/Z	X	X	X/Z	
24		X/Y/Z	Z		X/Z		
25		X/Y/Z	Z		Z		
26		X/Y/Z	Z		X	Z	Z
27		X/Y/Z	Z				
28		Z					

Table 8.5.

CLASS S6B (N=30)

Student Code	Time 1	2	3	4	5	6	7
Male (N=10)							
1				A	B	B	B
2				A	B	B	B
3			B	A/B	B	B	B
4			B	A/B	B	B	B
5			B	B	B	B	B
6			B	B	B	B	B
7			B	B	B	B	B
8			B	B	B	B	B
9				B	B	B	B
10	(Not in clique)						
Female (N=20)							
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X		X	X	X	X
16	X	X	X	X			X
17	X	X	X			X	
18			X	X	X		
19		X					X
20							X
21	Y	Y	Y	Y	Y	Y	Y
22	Y	Y	Y	Y	Y	Y	Y
23	Y		Y	Y	Y	Y	Y
24	Y	Y	Y	Y		Y	Y
25	Y	Y		Y	Y	Y	
26		Y	Y	Y			Y
27-30	(Not in cliques)						

Table 8.6.

CLASS S5 (N=60)

Student Code	Time 1	2	3	4	5	6	7
Male (N=30)							
1				Z		Z	Z
2				Z		Z	Z
3				Z		Z	Z
4				Z		Z	Z
5						Z	
6		X					
7		X					
8		X					
9		X					
10-30	(Not in cliques)						
Female (N=30)							
31						0	0
32						0	
33						0	0
34						0	0
35							0
36					Y		
37			Y		Y		
38			Y		Y		
39			Y		Y		
40			Y		Y		
41					Y		
42-60	(Not in cliques)						

Table 8.7.

CLASS S4 (N=46)

Student Code	Time 1	2	3	4	5	6	7
Male (N=30)							
1			X				
2	X	Y	Y	X			
3				X			X
4		Y	X/Y				
5	X		X/Y	X			X
6				X			X
7	X		X				X
8		Y					
9		Y	Y				
10					Z		Z
11					Z		Z
12					Z		Z
13							Z
14					Z		
15-30	(Not in cliques)						
Female (N=16)							
31-46	(Not in cliques)						

Table 8.8:

CLASS 06 (N=27)

Student Code	Time 1	2	3	4	5	6	7
Male (N=13)							
1		A		A			A
2		A	B	A			A/B
3		A	B	A/B	B		A
4		A/B	B	A/B	B		A/B
5	B	A/B	B	A/B	B	B	B
6	B	B	B	B	B	B	B
7	B	B	B	B	B	B	B
8	B	B	B	B	B	B	
9	B			B	B	B	B
10-13.	(Not in cliques)						
Female (N=14)							
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X/Y	X	X/Y	X	X
19	X	X	X/Y	X	X/Y	X	X/Y
20	X	X	X/Y	X	X/Y	X	X
21			Y		Y		Y
22			Y		Y		Y
23			Y		Y		
24			Y		Y		
25-27	(Not in cliques)						

Table 8.9.

CLASS 05 (N=19)

Student Code	Time 1	2	3	4	5	6	7
Male (N=10)							
1-10 (Not in cliques)							
Female (N=19)							
11-19 (Not in cliques)							

Table 8.10.

CLASS 04A (N=25)

Student Code	Time 1	2	3	4	5	6	7
Male (N=14)							
1			A				
2			A			B	
3			A/B			B	
4			A/B		B	B	
5			A/B		B	B	
6			B		B	B	
7			B		B	B	
8					B	B	
9						B	
10						B	
11-14	(Not in cliques)						
Female (N=11)							
15	X	X			X		X
16	X	X			X		X
17	X	X			X		X
18	X	X			X		X
19		X			X		X
20		X			X		
21					X		
22					X		
23-25	(Not in cliques)						

Table 8.11.

CLASS 04B (N=21)

Student Code	Time 1	2	3	4	5	6	7
Male (N=11)							
1		X					
2		X					
3		X					
4		X					
5-11	(Not in cliques)						
Female (N=10)							
12-21	(Not in cliques)						

Table 9. Number and size of cliques by size of class, grade and classroom organization for longitudinal (N=11) data.

	Total # of Cliques over School Year	Mean Size and S.D. of Cliques
Size of Class		
Large (27-60) N=7	1,3,4,4,4,5,5	5.57 (1.62)
Small (19-26) N=4	0,1,3,4,	5.00 (2.14)
Grade		
6 N=4	4,4,4,5	6.25 (0.50)
5 N=3	0,4,5	4.0 (4.0)
4 N=4	1,1,3,3	4.5 (1.0)
Classroom Organization		
Traditional N=3	1,4,5	6.0 (2.0)
Semi-traditional N=4	3,4,4,5	5.57 (1.62)
Open N=4	0,1,3,4	4.0 (2.83)

Table 10. Number of male and female students isolated from cliques for entire school year by grade and by classroom organization for longitudinal (N=11) data.

Grade	#M/F	MALE # isolates	MALE % of class	FEMALE # isolates	FEMALE % of class	TOTAL %
6th Grade						
T6	12/14	1	8%	4	29%	19%
S6A	10/18	3	30%	1	6%	14%
S6B	10/19	1	10%	3	16%	14%
06	13/14	4	31%	3	21%	26%
5th Grade						
T5	23/12	4	17%	7	57%	31%
S5	30/30	15	50%	23	79%	63%
05	10/ 9	10	100%	9	100%	100%
4th Grade						
T4	12/16	12	100%	10	63%	79%
S4	30/16	15	50%	16	100%	67%
04A	14/11	4	29%	3	27%	28%
04B	11/10	7	70%	10	100%	81%