Peer Networks and Students' Classroom Engagement

During Childhood and Adolescence

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DURING CHILDHOOD AND ADOLESCENCE

If one asks parents and teachers about important influences on children's motivation and adjustment to school, answers will likely suggest four sets of factors: the teacher and the general school environment, the psychological make-up of the individual child himself or herself, the family environment, and the child's relationships with his or her peers in school. In fact, research on school motivation and adjustment has examined all four influences. However, if one looks at current discussions of motivation and school adjustment (e.g., Ames & Ames, 1984; 1985), most research seems to concentrate on the first two factors, namely, the school and the child. Some efforts target the family; comparatively few include children's peers.

Characteristics of schools, classrooms, teachers, and students have been prime targets of motivational studies (Skinner & Belmont, 1993). In general, it is educational researchers who have focused on school and classroom contexts (for reviews, see Ames & Ames, 1985; Brophy, 1983; 1986), such as the role of teacher behaviors, of teaching styles or evaluation strategies (Boggiano & Katz, 1991; Brophy, 1985; 1986; Graham & Barker,Grolnick & Ryan, 1987; Keller, 1983; Midgley, Feldlauffer & Eccles, 1989;1990; Moely et al., 1992), and of the overall classroom environment and organization (Ames, 1984; Eccles, Midgley & Adler, 1984; Johnson & Johnson, 1985).

Psychological research has focused more on children themselves (for reviews see Ames & Ames, 1984;Dweck & Elliott, 1983; Stipek, 1993), and specifically on their understanding and explanations of their own role in the school environment. Key constructs are children's attributions (Weiner, 1979; 1985; 1986), their beliefs about themselves and the extent to which they feel in control (Chapman, Skinner & Baltes, 1990; Patrick, Skinner & Connell, 1993; Skinner, Wellborn & Connell, 1990;Weisz & Cameron, 1985), and their self-efficacy in the school environment (Schunk, 1991). Often, this is combined with examinations of children's

perceived abilities or competencies (McIver, Stipek & Daniels, 1991), goal orientations (Elliott & Dweck, 1988;Meece & Holt, 1993; Nicholls, 1984; Wentzel, 1989), learning strategies (1990Ainley, 1993; Pintrich & De Groot,), and interests (Schiefele, 1991), or of children's self-concept or self-worth (Covington, 1984; Wigfield & Karpathian, 1991). Last but not least, there is increasing interest in children's intrinsic motivation for academic activities and their sense of autonomy within the school environment (Connell, & Wellborn, 1991; Corno & Rohrkemper, 1985; Deci & Ryan, 1985).

Compared to both of these areas, research on other context influences on student motivation and adjustment is relatively sparse. Family oriented researchers have examined childrearing practices (e.g., DeBaryshe, Patterson & Capaldi, 1993; Dishion, 1990), parents' provision of autonomy support and involvement (Connell, Spencer & Aber, 1994; Gottfried, Fleming & Gottfried, 1994; Grolnick, Ryan & Deci, 1991), parental values, expectations, and standards (Stevenson, et al., 1990), as well as parents' explanations for children's success and failure (Holloway & Hess, 1982).

However, even this relatively small body of empirical work is large compared to the amount of research dedicated to the study of peer influences on school motivation and adjustment. Although the study of peer relationships has a long-standing theoretical and empirical tradition among developmentalists who are interested in social development (for reviews see Asher & Coie, 1990; Hartup, 1978; 1983), most attention has been directed toward variables like social adjustment, social behavior, and, if related to the academic domain, to achievement outcomes.

The fact that the current volume exists can be taken as evidence that this is changing, and that social relationships are accorded a more important role by many as a factor relevant for motivational development and adjustment to school. In this paper, we hope to contribute a specific perspective. Our chapter aims to examine the role of children's and adolescents' affiliations with peer groups in their developing school motivation during elementary and high

school. After outlining our general framework, which is based on a contextual understanding of

motivational development and oriented towards a self-system view of motivation, we will

describe a method that aims to identify students' peer contexts and shows promise for examining

how they are influential for students' motivation in school. To illustrate this perspective and

these methods, we will use data from two studies, one focusing on children in grades four and

five (Kindermann, 1993), and a new study on adolescents. Specific attention will be paid to two

motivationally relevant processes, namely processes of how children and adolescents select other

students as peer contexts for themselves, and how these peer contexts, in turn, can influence the

students' own subsequent motivational development.

Peer influences on motivation and achievement

There are many indications suggesting that children's peer relationships can have an important

role in their school adjustment and motivation, in addition to students' own psychological

profiles and their interactions with teachers. From a motivational standpoint, theoretical

expectations exist that children's need for belongingness (Weiner, 1990), their connectedness to a

"community of learners" (Skinner & Belmont, 1993), and feelings of relatedness to others in the

classroom (Connell & Wellborn, 1991) do extend to peers as well as adults.

Many of the characteristics of students' peer relations that are assumed to be influential

for their social development can also be regarded as influential for their motivational

development. Particularly prominent is the sociometric tradition which focuses on student's

overall standing and popularity in the classroom (e.g., Coie, Dodge & Copotelli, 1982).

Research has shown that a child's sociometric standing among his or her classmates is a strong

predictor of his or her further development (for reviews, see Newcomb, Bukowski & Pattee,

1993; Parker & Asher, 1987; Price & Dodge, 1989). Of specific interest for this paper are

findings that point to a relation between low social status and variables like risks for school drop-

out (c.f., Parker and Asher, 1987) and academic failure (Green, Forehand, Beck & Vosk, 1980).

A second tradition is the study of children's and adolescents' friendships (e.g., Berndt,

1989; Berndt, Laychak & Park, 1990; Cohen, 1977; Hallinan & Williams, 1990; Ladd 1990; Kandel, 1978a; b; Tesser, Campbell & Smith, 1984). Friendship researchers emphasize that adjustment does not only depend on how well one is liked or accepted overall, but also on more reciprocal aspects of peer relationships. Hence, adjustment depends on the individual as much as on the specific others with whom the individual becomes affiliated. Friendship researchers argue that different kinds of children have different kinds of friends and that friends have important functions for children's adjustment to school. For example, at early ages, the quantity and quality of children's friendships was found to be a predictor of their adjustment to school (Ladd, 1990). At older ages, friends seem to become even more important. From childhood to adolescence, there is some increase in the amount of time that individuals spend with their friends (Larson & Richards, 1991), an increase in the emotional quality during interactions with one's friends (Csikszentmihalyi & Larson, 1984), and an increase in the extent to which the quality of one's close friendships is related to social adjustment (Buhrmester, 1990).

One line of friendship research that is of special interest for the present discussion is represented by studies that examine which kinds of children or adolescents become friends with one another, and the specific processes of influence that occur between them. For example, Hallinan and Williams (1990) examined the effects of (about 1400) reciprocal friendships among adolescents on their college aspirations and later college attendance. As was found in many other studies, reciprocal friends were highly similar to one another, and the extent of similarity that existed among the friends was related to their academic behavior. Friends who were most similar with regard to gender, racial characteristics, and academic tracks also had very similar college aspirations. Interestingly, adolescents who had friends across gender, race, or tracking barriers tended to have higher college aspirations than others.

Our perspective is most closely related to a third tradition, namely, the study of children's peer group networks. Students' close friends may only be part of the picture; teachers and parents often believe that it is not just children's best friends who exert a powerful influence on

their adjustment in school, but the larger group of peers with whom they affiliate. Of interest are processes of influence that may exist among these networks of peer (e.g., Cairns, Cairns & Neckerman, 1989; Feiring & Lewis, 1989; Furman, 1989), and specifically, processes of peer selection (Who becomes a member of a peer group?), as well as of peer socialization (Do a child's peer group members have an influence on that child?). Like friendship researchers, proponents of a network approach have also investigated school motivation or school-related behavior in their studies. For example, Cairns and colleagues (1989) found that 7th grade students who later dropped out of school were likely to be members of peer networks that consisted of students who were also at risk for drop out.

Defining school motivation: The concept of engagement

Our studies were guided by a conceptualization of school motivation in terms of self-system processes (e.g., Connell, 1990; Connell & Wellborn, 1991; Skinner, et al., 1990). According to this model, motivational processes within the child are neither solely products of the child's own characteristics, nor of his or her context, but outcomes of dialectical relations between children's psychological needs and their experiences in interactions with their environment.

Engagement in the classroom is seen as the prime indicator of school motivation, and as the outcome of the extent to which children's needs are met by environmental characteristics at school (Connell & Wellborn, 1991). Typically, engaged children are described as selecting tasks at the border of their competencies, taking initiative when there is an opportunity, exerting effort and concentration when working on tasks, and persisting when tasks demand more than routine effort. On the opposite pole, children whose needs are not met by their school environment are likely to become disaffected. These children are passive, do not try hard, and give up easily when faced with tasks that demand more than routine exertion (Wellborn, 1991).

Students' engagement in classroom activities has considerable long-term consequences. On the one hand, the extent to which students are engaged in ongoing learning activities sets the stage for their academic achievement and adjustment; for example, engagement was shown to be

related to perceptions of control in the school environment as well as to children's sense of autonomy in the classroom (Patrick, et al., 1993; Skinner, et al., 1990). On the other hand, students' behavior is also likely to influence their social interactions with teachers as well as with other students in the classroom. For example, students' classroom behavior can influence teachers' opinions about their competencies (Bennett, Gottesman, Rock & Cerullo, 1993), as well as teachers' expectations of their further success (e.g., Brophy 1983; Jussim, 1989). Across time, engaged students are more likely to experience support from their teachers, and tend to become even more engaged, while disaffected students are likely to experience interactions with teachers negatively and to further decrease in motivation (Skinner & Belmont, 1993).

Challenges of studying peer network contexts and motivation

If there is reason to believe that peer contexts are important influences for students' motivation in school, why have these contexts not been studied more? Peer contexts have three properties that make them quite distinct from any other context studied traditionally.

First, they are self-selected to a large extent. Teachers and parents are contexts that are assigned to an individual child, whereas peer contexts usually are not. Within the constraints of a given setting, children are relatively free to affiliate with others according to their own needs and desires. However, these constraints may change from childhood to adolescence. In adolescence, for example, the age composition in mixed-grade classrooms may present constraints on peer selection processes within these classrooms, while at the same time a larger range of choices may exist, because students move across different classrooms during the school days.

Secondly, peer contexts consist of multiple and overlapping groups of individuals. Students need to be regarded both as individuals and as contexts for the other individuals with whom they share networks. In comparison to the contexts traditionally studied as influential for student motivation, these characteristics make peer contexts hard to identify.

Thirdly, although teachers typically remain stable contexts for a school year, and one's

parents for a lifetime, children's peer affiliations may <u>change</u> quite <u>rapidly</u> and unexpectedly.

This change may occur in two ways. Peer affiliations may change in terms of who does or does

not belong to a group. In addition, the members of a child's or adolescent's peer groups are other

children or adolescents. Thus, we need to assume that they themselves change or develop at the

same rate as our target individuals under study.

      <u>Identifying peer group networks</u>. Researchers in the area of peer relationships are

generally well aware of these problems. The methods for identifying categories of rejected,

popular, or neglected children within a classroom have been the topic of considerable discussion

(c.f., Asher & Hymel, 1981; Hymel & Rubin, 1985; Newcomb, et al., 1993). So have the criteria

for identification of social networks (e.g., Cairns, Gariépy & Kindermann, 1990; Wellman &

Berkowitz, 1988; Wasserman & Galaskiewicz, 1994). Perhaps the only area within this

literature that can be relatively certain about definitional criteria is the research on children's

friendships (e.g., Ladd, 1990). In friendship research, the phenomenon is usually restricted to

friendships on which two children agree reciprocally. However, as soon as we leave the age of

childhood, the definition of a friendship is can usually not be left any more to the subjects

themselves, and definitional problems are recognized (c.f., Adams, 1989).

      Similarly, social network researchers also rely on children's reports of their affiliations

with others, or even children's reports of other children's social connections. Children are

probably better informed about what peers are doing than most adults (or researchers). Their

reports as <u>expert observers</u> can then be compared to each other with regard to their reliability.

      With larger peer groups, the issue is usually to identify who, among a group of

candidates, can be assumed to be important for a given individual. Cairns, Perrin and Cairns

(1985; see also Cairns, Cairns, Neckerman, Gest & Gariépy, 1988; Cairns et al., 1989) have

developed a method for assessing children's peer networks among each other which also employs

children as expert observers of their whole classroom. Children's reports are obtained with the

goal to assess what is publicly known about existing peer associations; students are asked to

report about "who hangs around with whom?" in a classroom. These reports are usually based on free recall; groups of any size can be reported, and students can be nominated as belonging to any number of groups at the same time.

This method was also used in our studies: With children we used the original interview procedure, and with adolescents a paper-and-pencil adaptation that was administered in a group format. In response to the probe, students typically generate lists of names of students who belong to groups. For example one informant may recall students ALI, BEV, and CAR to be in one group, while another adds a second group consisting of GIL, HAL, and FIN. For our current paper, only these nominations for group membership are of interest. However, the method also allows for the inclusion of additional characteristics. For example, of interest may be specific functions that group members have (e.g., leaders), labels for the groups (e.g., "jocks"; which can indicate something about their activities), the typical features that make the individuals a group (e.g., all are interested in basketball), or the locations in which the groups usually meet.

Two specific advantages of the method should be noted before we go into the details of its use. One advantage is that informants do not just report about themselves, but about all the social configurations that are known in the classroom. This allows us to examine peer groups in classrooms in which not all students participate as informants themselves; usually, participation rates of at least 50% are recommended (Cairns et al., 1985). A second advantage is that it becomes possible to assess the consistency of the individual reports with the extracted map of publicly known group affilations in the setting.

Analyzing group nominations. In most cases, the reports will be too complex for just a qualitative analysis, and researchers may want to use reliability criteria for decisions about students' network memberships. Identification procedures usually proceed in two steps. First, a matrix is formed of co-nominations among students. This is a matrix of conditional nomination frequencies, given that a specific student is nominated to have a group himself or herself (see also Breiger's, 1988, P-matrix of "person-to-person relations"). Table 12.1 gives an example of

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co-nominations in a classroom that consisted of adolescents from 9th through 11 grade.

Insert Table 12.1 about here

The second step is to identify students' actual affiliates. Many statistical tools can be used to identify patterns in co-nomination matrices. Usually, these have the goal to identify overall network structures and to obtain a structural description of an entire setting (see, for example, Cairns, et al., 1990; Wellman & Berkowitz, 1988). However, we approached the question from a different angle, namely, from the perspective of individuals. Our question was not about network structures in general, but about who, among many candidates, can be considered to be a relevant context for a target child, and who cannot. Thus, there was little need to describe the <u>overall</u> environment, as is usually attempted by sociologists and social network researchers. Instead, the goal is to identify the exact peers with whom a student is affiliated.

Borrowing from strategies for analyzing social interactions (e.g., Bakeman & Gottmann, 1986; Sackett, Holm, Crowley & Henkins, 1978), we focused on conditional probabilities in patterns of co-nominations: Given that a specific individual has been nominated to be in a group with other students, how likely is it that any other individual is nominated to belong to the same group? And, are the conditional probabilities for these other individuals higher than could be expected by chance? Chance expectations are simply based on the nominations that the candidates had received among <u>all</u> group nominations. Discrepancies between observed (conditional) probabilities and their (expected) base rates can be tested via binomial <u>z</u>-tests (or using Fisher's exact test in cases of low expected frequencies; for ease of computation we use Stirling's approximation formula; see von Eye, 1990).

To give an example, (see also Table 12.1) in a classroom of 9th through 11th grade adolescents, student ALI was nominated 20 times, and student BEV was nominated 18 times to be a member of a group, out of a total of 323 groups that were generated by the respondents.

Thus, the expected rate for BEV to be nominated in any group of students was .06 (18/323). However, given that ALI was nominated to belong to a group, BEV was nominated to be a member of the same group in 18 out of the 20 cases, yielding a conditional probability of .90; the z-score of 16.99 is highly significant, denoting that ALI and BEV are members of the same group. These tests were conducted for all combinations of students in the classrooms under study. Connections that were found to be significant at the 5% level are depicted in Figure 12.1.

It should be noted that in this Figure, no distinction is made with regard to individuals' centrality in the whole setting or within their networks; individuals' positions are arbitrary and based on drawing convenience only. The method should mainly be considered as a tool to partition social ecologies into different kinds of contexts, namely, a context that can be considered to be central for a specific individual (one's own network of "buddies") and another context that is assumed to be of minor relevance (one's other classmates, or "bystanders").

Insert Figure 12.1 about here

Peer group profiles as descriptors of groups' motivational characteristics. Classical accounts (e.g., Moreno, 1934) as well as current sociological strategies of network analysis (see Wasserman & Galaskiewicz, 1994; Wellman & Berkowitz 1988) usually focus on structural characteristics to describe peer networks, as, for example, group size, cohesiveness, individuals' centrality within groups, or groups' centrality within the larger setting. However, we were more interested in the psychological characteristics of peer groups than in their structural parameters.

An assumption that became central for our efforts to describe peer affiliations was that groups can be described as a joint function of the characteristics of their members. This may be debatable, because it leads to aggregation of scores across all of the individual members of a given student's peer group. However, there are several advantages of taking this position. One advantage is the possibility of forming a group score or profile in order to express group

characteristics in one variable. A second advantage is that this group score allows us to then compare networks that differ in terms of structural characteristics (size, overlapping memberships, etc.). Third, across time, group change is likely to involve turnover in group memberships, and we may not want to limit ourselves to examining influences only among stable interaction partners.

A simple strategy for capturing the composite profile of a child's peer group(s) is to average the scores of the members of his or her network. In the example in Figure 12.1, this means that ALI's peer group score was the average of the scores of BEV, CAR, DAR, and EVE. All members of her peer group are considered to be of equal importance. However, alternative strategies are also possible; individual weights can be used in the averaging procedure if there is reason to assume that some individuals carry more weight than others, or standard deviations can be used if target questions are directed at examining group diversity.

Examining peer group processes

What we have discussed so far is a way to identify a student's networks of peers at some level of reliability, and a way to form a representation for the characteristics of this entire peer group. Taken together, these methods offer strategies to examine two basic processes of peer group dynamics: peer selection and socialization.

Peer selection processes. Theorizing about the nature of selection processes can be characterized by one statement: homophily rules. In childhood, as well as in adolescence or adulthood, friends and self-selected members of peer groups are usually more similar to one another than they are to people who are not friends or not members of the group (c.f., Cairns et al., 1989; Cohen, 1977; East et al., 1992; Hallinan & Williams, 1990; Jackson et al., 1991; Kandel, 1978a; Wright, Giammarino & Parad, 1986 ;).

Most findings about peer selection processes, when considering both the friendship and the social network research literatures, suggest that homophily may go in positive as well as negative directions. Traditionally, much attention has been paid to how deviant adolescents

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affiliate with deviant others (e.g., ; Cairns et al., 1988; 1989; Cohen, 1977; Dishion, Patterson, Stoolmiller & Skinner, 1991; Kandel, 1978a). However, there is also research that focuses on the positive side of peer affiliations, especially studies that include academic characteristics (e.g., Cohen, 1977; Hallinan & Williams, 1990; Kandel, 1978a).

How can selection processes be examined? A simple way is to inspect correlations between scores of individuals and of the members of their peer group(s). This can be done by using peer profile scores, or by using intra-class correlations between individuals and the members of their peer group(s). If group profiles are used, the correlation of individuals' own scores with the profile of their peer group can be interpreted in analogy to item-total correlations, in which an individual would be an item, and the group the total. Thus, these correlations give information about the extent to which individuals are similar to their peer group members.

Alternative strategies are also possible. In cases in which there is not much overlap across groups and there are not many individuals who hold memberships in many groups at the same time, analyses of variance can be used in order to test whether variances within groups are smaller than those across groups (see Kindermann, 1993). Alternatively, peer group profiles can also be directly based on the variance of the scores of a student's network members (instead of their average), and this variance can be compared with the variance across the other students who were not in this student's peer group (i.e., forming a non-peer group profile); group homogeneity is again denoted by differences between the group profiles and the non-group variances.

Peer socialization processes. Many motivational researchers assume that peers exert socialization influences on students' motivational development in school (e.g., Dweck & Goetz, 1978). Peer networks have been labeled "socialization templates" which define students' opportunities for interactions, opportunities for observing others in interactions, and their access to situations and activities (Feiring & Lewis, 1989, p. 125).

Strong socialization effects have been found in studies in which selection effects were experimentally controlled, as, for example, in the classic study by Sherif, Harvey, White, Hood

and Sherif (1961), in which children were assigned to different groups in a summer camp. However, when groups of peers were self-selected, rather than experimentally assigned, indications for socialization effects were found in some studies (e.g., Kandel, 1978b), while other studies caution us that these effects may be small (e.g., Berndt et al., 1990), or even negligible compared to selection processes (e.g., Cohen, 1977).

In the peer relationships literature, notions of socialization processes usually imply expectations that members of a group become more similar to one another across time. For example, Hall and Cairns (1984) found effects of social modeling by peers in an analogy to Bandura's classic bobo-doll study on aggression. Modeling of a peer was found to have stronger effects than the experimental manipulations themselves; it was the behavior of the peer that predicted most strongly whether aggression occured. With regard to motivation, Berndt and colleagues (1990) found that discussions among pairs of friends influenced their decisions in motivation-related dilemmas (e.g., whether to go to a rock concert or to complete a homework assignment) and made friends more similar in their decisions.

Often, however, socialization researchers are more interested in a further hypothesis, namely, that individuals in different groups do not just change towards the mean of their own group, but change in a way that magnifies the existing differences between groups. Thus, in a specific variable under study, the initially "rich" should become "richer" across time, while the "poor" should become "poorer". Accordingly, in the study by Berndt and colleagues, initially highly motivated students were expected to become more motivated, whereas low motivated students were expected to decrease in motivation. While this hypothesis was not supported in this specific study, it is nevertheless central to many investigations, especially to studies focusing on the negative role of peer group affiliations.

How can these socialization expectations be examined? If a students' peers influence his or her motivational development such that affiliations with highly motivated peers have a positive effect, while being with disaffected peers has a negative effect, change in this student's

motivation across time should be related to the motivational profile of his or her peer group at an earlier point in time. Regression analyses can be used to examine whether students' peer group scores can predict their own engagement at a later point in time, over and above their earlier engagement; significant correlations would indicate that the motivational composition of a student's peer group is related to change in his or her motivation across time.

<u>Availability of same-aged peers and selection and socialization processes in adolescence</u>

Peer selection processes are known to be primarily based on similarity among candidates. The extent to which candidates are available in a classroom who are highly similar to target students is an important factor in these processes. In fact, Kandel (1978a) found that among adolescents, similarity in grade levels was the one criterion in which friendship dyads showed most similarity. While this is not a critical issue in traditional elementary classrooms, in which children are usually of the same grade or age and peer group members can be selected from equals, this can be of major importance in classrooms which include students of different grades or ages, as is often the case for adolescents.

Thus, if a classroom of adolescents is mainly attended by students from a lower grade, but only by some students from higher grades, this can limit the latter students' access to peers who are most similar to them. Even if many classmates were of the same developmental level as a target student or similar to him or her in terms of academic interests, differences in grade levels or age may nevertheless make these peers quite inaccessible (or unacceptable) as potential members of that student's peer group.

Not much is known about the influences of classroom composition on students' development in general, and even less with regard to influences on academic variables. Most of the available information pertains to childhood. While reviews suggests that mixed-age playgroups and classrooms can have positive effects for younger children (e.g., Bailey, Burchinal & McWilliam, 1993; Howes & Farver, 1987; Urberg & Kaplan, 1986) and in later childhood (Miller, 1990; Pratt, 1986), this is much less clear with regard to adolescence, and often, negative

expectations prevail with regard to those adolescents who tend to affiliate with older peers (c.f., Magnusson, 1988)

Because mixed-age classrooms can impose constraints on peer group formation processes in terms of availability of most similar others (i.e., of classmates of the same age), analyses of selection and socialization processes should be able to incorporate differential expectations in adolescents' classrooms. For example, subgroups of students with different amounts of mixed-age peer group networks can be compared if sample sizes are large enough. Alternatively, proportions can be used of students' peer group members who are of the same age (versus of different ages). These proportions can be used as controls in regression analyses, if it is of interest whether peer homogeneity exists over and above an average level of mixed-age affiliations overall. Alternatively, they can be used as weights if it is of interest whether the amount of same-age (or cross-age) affiliations contributes to overall peer group homogeneity.

Similarly, the peer groups' age composition can be also taken into consideration for socialization analyses. Ususally, controlling for same-age or cross-age affiliations will be helpful if differential effects are not of interest; weighting procedures will be helpful if expectations exist that cross-age (or same-age) affiliations exert especially powerful socialization influences.

ILLUSTRATION: PEER GROUPS AND ENGAGEMENT ACROSS THE SCHOOL YEAR IN CHILDREN AND ADOLESCENTS

The second part of this paper will present an illustration of the peer network identification method and of the procedures we use to examine motivationally relevant peer selection and socialization processes. Data from two studies will be used: a study on 4th and 5th grade children (Kindermann, 1993), and an unpublished study of 9th through 12th grade adolescents.

In terms of its participants, the adolescents' study is quite different from the children's study. We had two goals with this study: One goal was to examine the use of the network

identification and description methods in this age range, and to find similar evidence for processes of motivationally based peer selection and socialization processes. The second goal was to do this in a less homogeneous setting, in which students were from a more diverse sociodemographic and ethnic background.

In the children study, two 4th and two 5th grade classrooms (N = 115) were targeted in a rural suburban school district in upstate New York. Students were lower-middle to middle class and almost equally divided by grade, classroom, and gender. The adolescents' study took place in an urban school district in Oregon, targeting five mixed-grade science classes (N = 102) which were attended by students from 9th through 12th grade.   Slightly more than half of the students were male and about half of the students were 9th graders. The classrooms exhibited a wide range of ethnic diversity; about 30% of the students were African American and about 30% of Hispanic or Asian origin.

All adolescents' classes were taught by the same teacher who had the explicit goal of encouraging group work and cooperative learning. Many students in these classes had previously experienced problems with science classes; in fact, the classes under study were part of an effort to restructure the school's science curriculum. We hoped that in such a setting peer group structures would be more pronounced, that their relations to classroom engagement would become more clear, and that, by working with one single teacher, interindividual differences in teachers' standards would be held constant.

Peer groups at the beginning of the school year

In the 4th and 5th grade classrooms, 57 children were individually interviewed about peer networks at the beginning of the year. In the adolescents' study, 68 students from the five classrooms filled out network assessments in a paper-and-pencil format. In these classrooms, candidates could also be freely chosen, but in contrast to the children's study, adolescents were encouraged to think about science work-groups at school in their reports. (Work groups were usually self-selected, with little guidance from the teacher.) Accordingly, there was some

overlap in nominations across classrooms; however, adolescents did not include peers who did

not attend any of the five science classes. (Figure 12.1 depicts of one of these classrooms.)

In general, networks of adolescents were more complex than those of children. For

children, although their networks were quite complex in some classrooms, there were mostly

dyads and larger networks were rare (nevertheless, there was one with 7 members). For

adolescents, although peer group structures were often larger, they were also more distinct and

less overlapping; there were many dyads and triads, and there was one cluster that consisted of

14 students. Among both children and adolescents there were students who were not connected

to a peer group (13 children, 11 adolescents).

On average, a child had about 2.2 other students included in his or her group; group sizes

did not differ across grades. In comparison, an adolescent had 3.16 students in his or her group,

and group size decreased with increasing grade levels (from 4.3 for 9th graders, to 1.7 for the

11th and 12th graders combined). Nevertheless, there were no indications of grade differences in

the number of students who were not found with a peer group.

We had also expected to see the "gender gap" in students' peer groups decrease with age.

For children, groups were exclusively comprised of peers of the same sex; among adolescents,

there were cases in which groups bridged across genders. Often, just one student of a different

sex was included in an otherwise same-sex group. On average, 80% of an adolescent's peer

group members were of the same gender.

Reliability of peer group assessments. Examinations of the extent to which maps of

identified groups were consistent with individual students' nominations focused on errors of

commission only. Thus, students who knew just about some groups but not about others were

still considered accurate if they agreed with their classmates on those accounts that they did

report. The overall kappa indices were .70 for children and .84 for adolescents.

Engagement at the beginning of the school year

Students' school motivation was measured using self-reports as well as reports by their teachers.

Connell and Wellborn (1991) have developed a ten-item scale which assesses students' perceptions of their own behavior in the classroom (e.g., "I try as hard as I can in school", or "When I'm in class, I just act like I'm working"). A parallel scale exists for measuring teacher-perceptions of students' engagement (Skinner, et al., 1990; Wellborn, 1991; e.g., "In my class, this student just tries to look busy", or "... works as hard as he/she can"). In previous studies, the scales were shown to have high internal consistency and stability across a school year (Skinner & Belmont, 1993), to be moderately intercorrelated, and correlated with grades and achievement scores in mathematics, language, and science (Skinner et al., 1990; Wellborn, 1991).

In both studies, students' self-reported engagement was initially measured about one month after the beginning of the school year; 109 children and 90 adolescents participated. With regard to teacher reports of motivation, the four teachers of the children's classrooms provided reports for all participating students; in the adolescents' study, the science teacher reported on 47 students from three of the five classrooms.

We only had partial success in securing a wider range of motivational scores in the adolescents' data than were obtained with children. Children, on average, had a self-reported motivation score of 3.2 (the scale ranges from 1 to 4); adolescent's average motivation score was 2.9. Also, the ranges of individuals' scores were more comparable than we had expected (for children, the range was from 1.33 to 4.0; for adolescents from 1.46 to 4.0; SD's = .44 and .49).

As was the case in the children's data, the adolescents' teacher also tended to regard her students' motivation to be significantly lower than they did themselves. However, on average, adolescents' classrooms showed a smaller range of engagement scores (SD = .44) than did the children's classrooms (SD = .59; means: 2.62 and 3.00), which may have been due to the decision to work with one teacher only. It should be noted that the teacher had not paid selective attention to specifically high or low motivated adolescents; the 47 students with teacher-reports did not differ in their self-reports from the other students on whom no reports were available.

Grade differences. In the literature, there is ample evidence for a decline in children's

motivation for school with increasing grade level (e.g., Skinner & Belmont, 1993). In the children's study, there had also been differences favoring younger children (self-report averages: 3.24 for 4th, and 3.07 for 5th graders). We found further decreases for the adolescents (from 3.0 in 9th grade down to 2.7 for the 11th and 12th graders combined). However, as was true for the children's study, there were no grade differences in adolescents' teacher-reported engagement. Thus, here were indications that adolescents in higher grades felt <u>less</u> motivated themselves, but that they did not appear so to the teacher.

<u>Peer groups and motivation at the beginning of the school year</u>

Our main questions were about the <u>motivational composition</u> of children's peer groups in elemenary school and adolescents' peer groups in mixed-age classrooms. We were first interested in the extent to which students were affiliated with others who shared a similar motivational orientation to school. Group similarity is an important indicator that peer selection processes proceed according to motivational criteria.

     <u>Peer group selection</u>. As descriptors for the motivational profiles of students' peer groups we used the average of their members. Children's peer group scores ranged from 1.33 to 4.0; adolescents' group scores ranged from 1.46 to 4.0. Analyses of variance showed that differences between individual students' scores and their peer group scores were not significant for either children or adolescents.

     We considered correlations between individuals' scores and those of their peer network profiles to be indicators of the extent to which selection processes had led students to select members for their peer groups who were similar to themselves. For both children and adolescents, individuals' own scores corresponded significantly to the profile scores of their peer networks with regard to self-reported motivation (with .28 and .27). With regard to teacher perceptions, group homogeneity was present for children (r = .55), but not adolescents (r = .23).

     <u>Grade differences</u>. There were little grade differences in children's or adolescents' peer groups. The only exception was found with regard to teacher reports of adolescents' motivation,

denoting that 11th and 12th graders had peer groups that were perceived as significantly <u>more</u>

motivated than groups of students in grades 9 and 10 combined (profile averages 3.25 versus

2.52). The adolescents' results were contrary to our expectations, because there had been

declines with grade in individual students' own engagement. We concluded that students in

higher grades, although less motivated themselves, were affiliated with peers who were not less

motivated than peer group members of students from lower grades.

Across adolescents' grades, peer group homogeneity was pronounced for the 9th graders

(self-report: $\underline{r}$ = .50, $\underline{n}$ = 36, $\underline{p}$ < .01; teacher-report: $\underline{r}$ = .78, $\underline{n}$ = 17, $\underline{p}$ < .001.), but did not exist

for students in higher grades. Group similarity seemed to decrease with increasing grade level.

While students in lower grades had succeeded in seeking out others who were motivationally

similar to themselves, adolescents in the mixed-grade classrooms who were of higher grades may

not have had the same opportunity to do so. This was also evident in the proportions of mixed-

grade versus grade-homogenous peer affiliations. On average, 9th graders had 90% of their

affiliations with other 9th graders, 10th graders had 60% from the same grade, but 11th and 12th

graders had 60% of their peer group members from grades <u>outside</u> their own.

In sum, there was evidence that children were affiliated with peer groups that were

similar to themselves at the beginning of the school year. However, for adolescents in the

mixed-grade classroomes there were differences with regard to grade levels. Students in 9th

grade were more highly motivated themselves, had usually larger networks which more often

included other 9th graders, and there was considerable homogeneity within these groups.

Adolescents in higher grades, who had been less motivated initially, had fewer classmates with

whom they were affiliated, a higher percentage of those was from lower grades, and their groups

were less homogeneous with regard to their motivational composition. Nevertheless, it appears

that some of these students were able to compensate for their own low motivation by affiliating

with others who were at least as motivated as the group members of students from lower grades.

<u>Peer groups across the school year</u>

At the end of the school year, 27 of the children from one 4th grade classroom were individually re-interviewed about peer networks in the classroom. In the adolescents' study, 28 students participated again from three of the five classrooms that were studied initially ($\underline{N}$ = 61). While the number of reports in the adolescent study appears to be low, the reliability index of the composite map across the individual reports ($\underline{\kappa}$ = .88) at the end of the year indicates that the composite map is nevertheless reliable.

All of the children who had been without a group at the beginning of the year in the one longitudinal 4th grade classroom had acquired membership in a group by the end of the school year. For adolescents in the longitudinal classrooms, 6 of the 8 students who had been without a group at the beginning of the year were still without a group at the end; only two students had gained membership in a group across the year. However, there were 19 additional adolescents who had lost all of their initial affiliations. (All of these were not present at the second measurement point of the study.)

Group stability. Across time, stability of children's peer group membership was low; about 50% of a child's peer group members were exchanged across time. Adolescents' groups were characterized by even larger instability, showing a 75% rate of member turnover. While children's membership changes were mostly due to additions of new members (on average, group size increased from 2.2 to 2.64 members), adolescents' peer group changes were characterized by losses of members (on average, group size decreased from 3.16 to 1.85 members). However, this does not imply that change was random; there were some groups of various sizes which stayed entirely stable across the year (e.g., the cluster of students ALI to EVE in Figure 12.1). Also, stability of adolescents' peer group memberships decreased significantly with increasing grade level; for students who were above grade 9, more than 80% of their peer group members were exchanged or lost across time.

Engagement across the school year

Within a month of the end of the school year, all of the children of the longitudinal 4th grade

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classroom participated again in a second questionnaire assessment. In the adolescent study, 28

students from the three longitudinal classrooms participated again; 23 students were not present

during any of the three days when the survey took place. According to their records, these

students had not dropped out of school but were just absent. Seven other students were excluded

who had left the school or had shifted to different classrooms that were not part of the study; the

status of three missing students could not be determined.

Across the school year, there were no significant changes in children's or adolescents'

motivation. There were also no grade differences in engagement scores at the end of the school

year for either children or adolescents. Analyses of variance showed that this was an outcome of

differential attrition in the sample; the students from the longitudinal classrooms who were

present at the second measurement point had already been more engaged at the beginning of the

study in terms of self-reports as well as teacher-reports.

Peer group selection and socialization processes across the year

For purposes of examining peer selection processes across the year, we treated students'

motivation as if it had remained constant across the school year. In order to construct peer group

profiles for the end of the school year, we used students' own engagement scores from the

beginning of the school year in combination with the information on their group affiliations at

the end of the year. Thus, correlations between students' peer group profiles at the beginning and

end of the year yield information about the extent to which group member turnover had an

influence on the groups' motivational composition across time when students' intraindividual

motivational change across time was controlled.

Children's as well as adolescents' peer groups had remained quite stable across the year in

terms of their motivational composition, despite the fact that at least half of the members had

been exchanged. Correlations between group scores across time were significant for self-

reported engagement in children ($r = .47$; $p < .05$, $n = 25$) and adolescents ($r = .45$, $p < .01$, $n = 37$),

as well as for teacher-reports (children: $r = .80$, $p < .001$, $n = 25$; adolescents: $r = .69$, $p < .001$, n

= 31). Thus, although many of the members of a student's peer network were exchanged, there was nevertheless considerable continuity in the motivational make-up of students' peer groups.

With regard to adolescents, an additional indication for peer group continuity across time can be seen in the fact that stable peer groups also led to a higher probability that students participated in the second measurement point of the study. On average, nearly 40% of the stable members of a student's group were present in the classroom again at the end of the year. However, among students' ties that were not maintained across the year, 95% of the cases were ties with peers who were not present at the end of the year.

Finally, we examined potential socialization influences of students' peer groups on their own motivational development. For these analyses, we used students' group profiles from the beginning of the year in combination with their individual self-reports of engagement from both the beginning and the end of the school year.

For children, there were clear indications of motivational socialization through peer groups. Regression analyses examined the extent to which individuals' engagement at the end of the year could be predicted from their peer group scores at the beginning of the year, when their own engagement at this earlier time was controlled. The results showed that changes in children's own engagement could be predicted by the initial composition of their peer networks ($\underline{\beta}$ = .15, $\underline{t}$ = 2.06, $\underline{p}$ < .05, $\underline{n}$ = 96). For the adolescent study, we had originally hoped for stronger effects, because we expected a broader range of self-reported engagement scores. We did not find such a broad range in our sample. In addition, we needed to revise our expectations, because of the very high rate of membership turnover that existed overall. Probably, little can be expected in terms of peer group socialization if the overwhelming majority of one's group members do not remain stable socialization agents across time.

Hence, we included two further refinements in the analyses. First, socialization effects were expected to be stronger in adolescent peer groups which stayed together for a longer time, and we included an index of network stability across time for our analyses. This index was the

percentage of individuals who remained stable members of a student's group across time, and was used as a control. Thus, socialization effects were examined under the assumption that all students had the same number of stable peer group members. By the same token, adolescents who did not have at least one stable member were excluded from the analysis.

Secondly, we took the mixed-grade design of the adolescent classrooms into consideration. Students' grade differences were of less interest to us than the question of whether the mixed-grade design of the classrooms offered opportunities for some students in terms of their motivational development. Since some (but not all) of the peer groups in our adolescent classrooms consisted of students from different grades, we wanted to examine whether the grade-composition of students' peer networks contributed to changes in students' engagement in combination with the motivational characteristics of these groups. In order to do so, we included the proportion of an individuals' peer group members that were in different grades as a weighting factor in the analysis.

Thus, we examined whether an individual student's peer group profile at the beginning of the year, when weighted with the proportion of his or her peer group members who were in a different grade, and when controlling for the level of stability within his or her group, allowed us to predict how that student's own motivation would change across time. The results were consistent with our expectations: Students who were with highly motivated peer groups and who had many of their members from grades that were different from their own were likely to increase in motivation across time (on average by about .20 points on the 4-point scale). Students who were affiliated with groups that were low on motivation and showed little grade diversity decreased slightly across time ($\underline{\beta}$ = .48; $\underline{t}$ = 2.51, $\underline{n}$ = 18, $\underline{p}$ < .05). We regard this as an indication that the mixed-grade design of the classrooms (as well as the teacher's encouragement to form groups that work together) had offered some advantages for students who managed to bridge across grade barriers in their peer networks.

DISCUSSION: PEER GROUP SELECTION AND SOCIALIZATION PROCESSES IN ELEMENTARY SCHOOL AND HIGH SCHOOL CLASSROOMS

The goal of the current paper was to describe a method for identifying students' peer groups in school as well as to describe its applications for the study of peer selection and socialization processes in childhood and adolescence. Specifically, we wanted to examine the use of this method in a setting of adolescents that was characterized by a large amount of diversity. In adolescence, classrooms are quite common in which students differ with regard to age and grade level, although these classrooms may be more homogeneous with regard to students' performance or academic achievement. As was the case in the current study, these classroom environments are often formed with the specific goal of encouraging students' to learn from one another, both in terms of social and academic development.

The results of both studies indicated that at the beginning of the school year, self-selection processes among the students led to peer groups that were quite homogeneous in terms of their motivational composition. The only difference between selection processes in children and adolescents was that there were grade differentiations in adolescents' (mixed-grade) classrooms. Peer group homogeneity was stronger for 9th graders and for students who had more of their peers from the their own grade.

Across the school year, children's peer groups remained moderately stable in terms of peer group memberships. In comparison, adolescents' groups were characterized by an enormous turnover rate. This rate of change matched perceptions of the teacher, who also reported that adolescents' groups changed greatly in terms of work group membership. Nevertheless, the motivational make-up of students' peer groups remained quite stable across time. Peer group members seem to have been replaced, dropped, or newly integrated into networks in a way that left the motivational composition of these groups intact.

Peer socialization processes were examined as the extent to which the motivational profile of a student's peer group members at the beginning of the school year allowed for the

prediction of that child's own motivational change across time. For children, we found clear

evidence that self-selected peer group contexts can have socializing effects on individuals

themselves across time: Children who were affiliated with highly motivated groups changed

positively across the school year, while children who were with less motivated groups changed

negatively. For adolescents, the evidence for socialization effects was clearer for students who

had peer networks that included many peers from different grades. This needs to be taken with

caution, because our survivor sample of students who participated at both measurement times

had been relatively highly motivated right from the start. However, the results are encouraging.

Despite the differences, there are similarities with regard to the general finding that the

motivational composition of students' peer groups at the beginning of the school year was

indicative of these student's own motivational development across the year.

   Motivational variables and peer selection and socialization processes. We would like to

add a note of caution: Students' motivational characteristics may not be the direct target of

selection or socialization processes; what appears to be indications of selection and socialization

according to motivational criteria may be by-products of processes that are directed towards

other criteria that are more salient in interactions among students. Studies by Cohen (1977) and

Kandel (1978a) caution us that academic variables may not be the characteristics on which peer

group members may be most similar to one another. For example, selection processes may also

be based on sociodemographic variables, achievement, intelligence, or on classroom behavior

that is openly observable by others, at least at the beginning of a school year. Similarly,

socialization processes may not target motivation directly but rather academic or social

behaviors. Some of these behaviors may be facilitative of (or compatible with) classroom

engagement and others may be incompatible with classroom engagement. Considering that there

are relations between students' social behavior in the classroom and their academic achievement

(c.f.,DeBaryshe, et al., 1993; Wentzel, 1991; Wentzel, 1993), it may well be that peer selection

and socialization processes are more directly targeting social, rather than academic behaviors.

The extent to which this is the case may be a matter of the specific classroom settings in which peer processes are studied, of the classrooms' agenda and of the specific goals of the teacher, but also of the kinds of students who attend the classrooms. In addition, it seems likely that students' age can play a role in the extent to which peer groups are influential for motivational development. However, in our understanding, all of these variables will mostly affect the <u>strength</u> with which peer selection or socialization processes pertain to school motivation. In other words, if motivational change is a by-product of peer group processes, links to peer selection and socialization processes can be expected to be weaker than if motivation was a direct target of these processes.

<u>Integrating the strands of peer relationships research</u>

Our studies point to peer group selection processes as key processes by which children and adolescents seem to select contexts for themselves in the classroom, which then, via socialization processes, have implications for their own further motivational development. On this general level, our results seems to be entirely compatible with results of other researchers, such as, for example, studies of children's or adolescents' friendship patterns. Nevertheless, we think that the current framework can provide some additional information.

The methods presented for peer group identification seem to be especially promising if they are combined with existing frameworks from the friendship and sociometrics literatures. On the one hand, by combining network methods with sociometric classification systems (e.g., Coie et al., 1982; Newcomb & Bukowski, 1983), we could find out about the role of sociometric popularity within and across peer groups. Do individuals who belong to popular, neglected, or rejected categories of children share connections with each other, or not? Are popular children "stars" who have connections to all kinds of different other children, while rejected children are more isolated? Are neglected children "satellites" and candidates for group inclusion who have outlier positions in otherwise more coherent networks? Are the children within one's network

rated as more likeable than children on the outside?

Further questions could also be addressed by combining network methods with methods used in the friendship literature (e.g., Ladd, 1990). Are one's friends usually members of one's network or is friendship something special and one's close friends are as likely to be members of one's peer network as they are outsiders? Are friends more influential in terms of socializing influences than the larger group of one's peer network members?

Combining these methods could also help in addressing more specific motivational questions. Processes of how students select members for work groups in school may be affected by their overall popularity, and so may their socializing influences on individuals. Work groups that include one's friends may have stronger socializing influences than work groups that don't. In particular, student's peers may have influences on the formation or maintenance of friendships, and it is entirely possible that resulting friendships have socializing influences that are stronger and more specific than those that emanate from students' larger peer group networks.

Peer Group Networks as Socialization Contexts for Motivational Development

We have started out with our chapter by pointing out that contemporary research on school motivation is mainly oriented towards intraindividual explanations, or towards explanations that focus on the teacher as the central motivating force. In contrast, our framework focuses on students' social relationships with peers, and on processes of peer selection and socialization. Because peers are students themselves who are developing at the same rate as target students under study, it is essential that a framework for studying their influences pays attention to the notion that individuals' development proceeds within contexts that change themselves, and that individuals can have an active role in determining who or what will be a socialization context for their development (Kindermann & Skinner, 1992; Kindermann & Valsiner, 1995).

On a large scale, the methods presented in this chapter have two general objectives. The first goal was to show that it is possible to partition the social ecology of a student in the classroom into sub-units that can be expected to be particularly influential for this student's

further development. The second goal was to demonstrate how specific pathways of reciprocal peer influences can be examined across time. In terms of influence processes, peer selection and peer socialization processes are traditionally regarded as most important.

Findings that children's and adolescents' peer groups change rapidly across the time span of a school year have made it difficult in the past to study their influences. A large amount of member turnover in students' peer groups across time may often be regarded as a sign that nothing much stays stable in terms of peer relationships and that changes are rather unpredictable. We regard our findings as indicating that this depends on how we conceive students' peer contexts in school. While the individual 'faces' of students' peer networks may change rapidly, there nevertheless seems to be considerable continuity in the psychological characteristics of these groups. In our findings, the motivational profiles of children's and adolescents' peer networks remained quite unaffected by the vast changes in who was a member of these groups at different points in time. In addition, we have found indications that these peer networks, in turn, can also have developmental influences on individuals.

The methods presented in this chapter seem to offer ways to identify contextual agents as well as to examine their developmentally influential characteristics at different points in time; they also seem to allow us to examine how changes within individuals are related to changes within their contexts. The specifics of these methods may be in need of further refinement and elaboration. However, for studies of the role of self-selected peer networks on student's development, it is this perspective on developing person-context relationships, over and above the specifics of the methods used, that may be most useful for future research on the social determinants of students' school adjustment and motivation.

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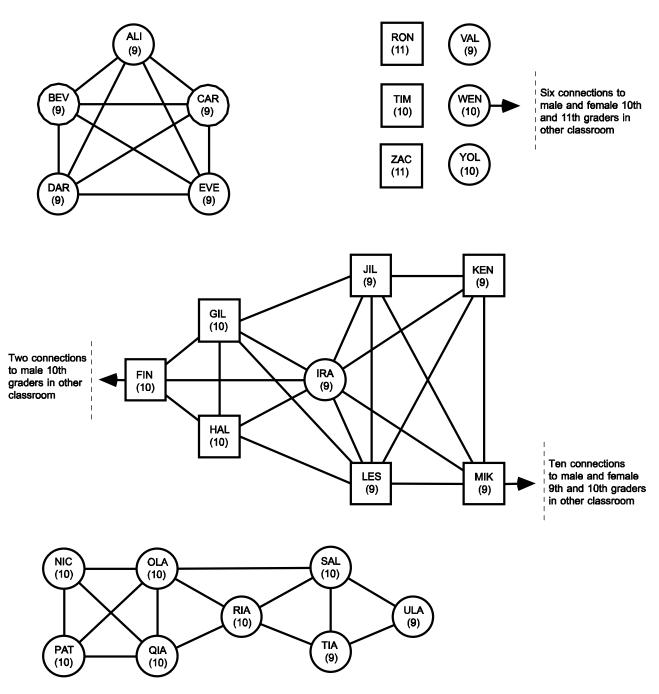Wright, J. C., Giammarino, M., & Parad, H. W. (1986). Social status in small groups:

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Table 1. Matrix of co-nominations for groups in a classroom attended by 9th through 11th graders.

	ALI	BEV	CAR	DAR	EVE	FIN	GIL	HAL	IRA	JIL	KEN	LES	MIK	NIC	OLA	PAT	QIA	RIA	SAL	TIA	ULA	Total Nominations
ALI	-	18	19	19	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
BEV	18	-	17	17	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
CAR	19	17	-	20	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
DAR	19	17	20	-	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
EVE	18	16	17	17	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
FIN	0	0	0	0	0	-	20	20	5	3	3	3	2	0	0	0	0	0	0	0	0	29
GIL	0	0	0	0	0	20	-	20	5	4	4	4	3	0	0	0	0	0	0	0	0	21
HAL	0	0	0	0	0	20	20	-	5	3	3	3	2	0	0	0	0	0	0	0	0	20
IRA	0	0	0	0	0	5	5	5	-	7	14	5	7	0	0	0	0	0	0	0	0	17
JIL	0	0	0	0	0	3	4	3	7	-	11	14	15	0	0	0	0	0	0	0	0	16
KEN	0	0	0	0	0	3	4	3	14	11	-	9	11	0	0	0	0	0	0	0	0	33
LES	0	0	0	0	0	3	4	3	5	14	9	-	13	0	0	0	0	0	0	0	0	14
MIK	0	0	0	0	0	2	3	2	7	15	11	13	-	0	0	0	0	0	0	0	0	16
NIC	0	0	0	0	0	0	0	0	0	0	0	0	0	-	8	8	8	2	2	2	1	11
OLA	0	0	0	0	0	0	0	0	0	0	0	0	0	8	-	9	16	5	4	2	2	18
PAT	0	0	0	0	0	0	0	0	0	0	0	0	0	8	9	-	9	2	2	1	1	12
QIA	0	0	0	0	0	0	0	0	0	0	0	0	0	8	16	9	-	5	2	0	0	16
RIA	0	0	0	0	0	0	0	0	0	0	0	0	0	2	5	2	5	-	9	3	2	12
SAL	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	2	2	9	-	5	4	11
TIA	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	1	0	3	5	-	11	13
ULA	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	2	4	11	-	11

Note: Matrix shows the number of times each student in the classroom was reported to be in a group together with any other student.   A considerable number of co-nominations with students from other classrooms is omitted. Across all classrooms,, 323 groups were generated by 73 informants; the total of group nominations was 1082. Six students were not nominated to be in any group in this classroom.

Figure 1. Map of social networks in a Science classroom of 9th through 11th graders ($p < .05$).

Note: ☐ are male, ○ are female students.

Students' grade levels are given in parentheses.