Can We Make Causal Inferences about the Influence of Children’s Naturally-Existing Social Networks on their School Motivation?

Thomas A. Kindermann
Portland State University
Department of Psychology


I am indebted to the late Robert B. Cairns from UNC Chapel Hill for introducing me to SCM. I want to thank Jaan Valsiner (Clarke University) and Jean-Louis Gariépy (UNC Chapel Hill) for discussions of SCM, and James P. Connell (Institute for Research and Reform in Education, Philadelphia, PA), for discussions about analyses of change. Special thanks go to Ellen A. Skinner (Portland State University) for her suggestions for models of analysis and her insightful critiques of my papers. Peter Usinger (now Polk Community College, FL) and Marcus Daniels (now Santa Fe Institute) deserve thanks for programming, Michael Belmont for organizing the data collections, and Tanya McCollam-Fantaski, Caroline Bettridge, Beate Metzler, Ellsworth Gibson, Wendy DeCourcey, Kristen Hillier, Nicole Sage, Todd Colvin, Melissa Kenney Ngaruri, and Becky Sanders for their help with data collections, data formatting, and analyses.

The projects were supported by Faculty Development Grants from Portland State University and by Academic Research Enhancement Awards from NICHD (1R15HD31687-01;1R15HD37848-01). Correspondence address: P.O. Box 751, Portland State University, Portland Oregon, 97207-0751; kindermann@pdx.edu.
Can We Make Causal Inferences About The Influence Of Children’s Naturally-Existing Social Networks On Their School Motivation?

When researchers try to characterize the role of peer influences in child development, they find themselves caught between two extremes. Five decades ago, the dominant position was that the role of peers was almost negligible. The important influences that shaped children’s development were all considered to come from adults, and mainly from parents and teachers. There was little empirical research on the developmental impact of peers. For the most part, children’s relationships with other children were considered to be outcomes of healthy development and diagnostic indicators of their social functioning.

This position has been almost completely reversed in recent years. Today, parents and teachers seem to be convinced that peer relationships exert strong effects on children’s academic motivation, their behavior in the classroom, and their academic success. Researchers have re-discovered theorists’ claims that relationships with age-mates constitute important socialization influences (e.g., Baldwin, Piaget, Vygotski), and have come to re-appreciate the corresponding empirical contributions from the 1930s (e.g., Sherif, Parten, Moreno; see Renshaw, 1981). Today, some theorists even insist that the most important bonds shaping children’s development are with peers and that influences from adults are comparably small (e.g., Harris, 1998). Consistent with such claims, studies continue to reveal strong correlations between children and their peers, and experimental studies document the potential causal influences from peers.

Amid these extremes, some researchers point out the need for a more balanced position (Berndt & Murphy, 2002; Jaccard, Blanton, & Dodge, 2005; Kindermann, 2003; Rubin, Bukowski, & Parker, 2006). On the one hand, they agree with the Zeitgeist that peer relationships are ubiquitous in children’s lives and play an important role in their development. On the other hand,
they are skeptical about the extent to which most empirical studies actually support these claims. Serious questions exist about what correlations between children and their peer groups mean. Although, without exception, studies show that children with high quality peer relationships tend to do better in school, is this because peers support school performance? Or is it because children who do well at school tend to affiliate with peers who are highly functioning? Or, is it possible that quality of peers and school performance are not causally related at all, because they are both caused by some third variable, such as high quality parenting or teaching?

Rather than making specific claims, these researchers have concentrated their efforts on identifying the most valid analytical procedures for examining them. They point out that empirical studies are faced with four critical challenges (e.g., Berndt & Murphy, 2002; Jaccard, et al., 2005; Kindermann, 1996; 2003): Who among a child’s peers is most important? How can the relevant characteristics of peer affiliations be specified and measured? How should processes of influence be conceptualized and tracked empirically? How can studies be conducted so that we can be relatively certain that correlational findings indicate actual peer influences?

The contention is that when careful procedures are used so that the interdependencies between the characteristics of individuals and those of the members of their peer groups are taken into account, a more accurate picture of peer influences will emerge. A tacit assumption is that peer effects identified in such studies will not be as large as suggested by experimental studies in which peers are randomly assigned to children. Nevertheless, as this chapter aims to show, there is reason to believe that they will be present and that they will hold up against the simultaneously competing effects of member selection processes and of influences from other sources.

The chapter is organized in four parts that follow the four key questions. In each section, empirical examples of specific strategies will be based on two previous studies (Kindermann, 1993;
Peer Networks and Social Influence in School

Kindermann, 2007); the specifics are outlined in Table 1. The first part addresses questions of network identification. A review of the correlational evidence for peer influences on

Table 1
Design characteristics of two studies that used Socio-Cognitive Mapping to examine peer group influences on children’s engagement in the classroom

<table>
<thead>
<tr>
<th>Study</th>
<th>Kindermann, 1993</th>
<th>Kindermann, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>109 children: two 4th and two 5th grade classrooms</td>
<td>366 children: entire cohort of 6th graders in a town</td>
</tr>
<tr>
<td>Design</td>
<td>Fall/Spring student self-report Measures</td>
<td>Fall/Spring teacher-report; Fall student measures</td>
</tr>
<tr>
<td>Measures</td>
<td>SCM Interviews: 57 children (52% of four classrooms)</td>
<td>SCM questionnaires: 280 children (76% of grade cohort)</td>
</tr>
<tr>
<td></td>
<td>Peer networks in classrooms, $\kappa = .70$</td>
<td>Peer networks in 6th grade, $\kappa = .88$</td>
</tr>
<tr>
<td></td>
<td>Nominations of group &quot;names&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Friendship nominations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Student Self-report of Behavioral Engagement</td>
<td>Teacher-report of Student Behavioral and Emotional Engagement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Student-reports of Teacher and Parent Involvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mathematics Grades in 5th and 6th grade</td>
</tr>
</tbody>
</table>

children’s motivation and behavior in school is followed by a discussion of the major ways that peer network information can be collected, with a specific focus on Robert Cairns’ strategy of
Socio-Cognitive Mapping. The second part outlines how the psychologically relevant characteristics of peer networks can be captured once networks have been identified. The third part addresses how peer group influences can be conceptualized in longitudinal designs that focus on children’s own change as an outcome of influences from their groups. The final part introduces additional safeguards to make sure that the correlational findings can be interpreted as peer influences.

**How can Naturally-Existing Peer Groups in School be Identified?**

Naturally-existing peer groups are a ubiquitous part of children’s lives. They are usually self-organized, ‘fuzzy’, overlapping, and highly fluid. Unlike work groups or clubs that have specific purposes, they are more informal and circumstantial in nature, and are formed for a variety of reasons (Arrow, McGrath, & Berdahl, 2000). Ever since Moreno’s (1934) pioneering efforts to define sociometric groups, it has been assumed that knowledge about a person’s affiliations with a group has diagnostic value for assessing his or her functioning, and that group membership leads to social interactions that exert socialization influences. Several approaches have provided evidence that characteristics of such affiliations predict positive and negative aspects of children’s social and academic development. For example, characteristics of children’s friends have been shown to predict academic performance as well as problem behavior (e.g., Altermatt & Pomerantz, 2003; Berndt, Hawkins, & Jiao, 1999; Poulin, Dishion, & Haas, 1999; Urberg, Değirmencioğlu, & Pilgrim, 1997; Wentzel, McNamara-Barry, & Caldwell, 2004). Similarly, membership in sociometric “groups” has been linked to adjustment in school (e.g., Bukowski & Cillessen, 1998; Chen, Chang & He, 2003; Guay, Boivin, & Hodges, 1999), and so has membership in social crowds and groups of children who typically just “hang out” together (e.g., Brown, 1999; Cairns, Cairns, & Neckerman, 1989; Kindermann, 1993).

**Access To Relationships: Self-Reports, Partner-Reports, And Observer-Reports**
To identify peer groups, researchers have traditionally focused on *self-reports*. However, skepticism has been voiced about whether self-reports of affiliations are always accurate (e.g., Cairns & Cairns, 1994) because children tend to exaggerate their associations with popular peers (Leung, 1996). Thus, alternative strategies have been developed to define peer groups more objectively. Friendship researchers have dealt with this by focusing on *reciprocity* between self- and partner-reports; friendships are assumed to exist when both friends agree. However, participation rates can create problems because a friendship can only be identified if both friends participate in a study. This reduces the information available in a data set; analyses are usually restricted to a child’s three best friends, and across time, often to just one stable best friend.

Because reciprocal dyads tend to form interconnections, researchers have expanded their focus to *friendship groups*, defined as groups of reciprocal self-reported dyads (e.g., Urberg, et al., 1997). Such groups are often very complex, and graph-theoretical reduction techniques are used in common identification programs (e.g., NEGOPY, Richards, 1995; UCINET, Borgatti, Everett, & Freeman, 1999). Typically, three conditions are invoked: First, a child is considered to be a member of a group when he or she can be reached from every other member directly or via an intermediary connection; individuals further removed away are excluded. Second, a group is accepted to exist when removal of any single individual within the group would not make it fall apart. Third, a friend of a specific child’s friend is also assumed to be affiliated with that child, even if he or she does not share a direct reciprocal connection.

When the goal is to identify overall group structures parsimoniously, topological assumptions are plausible. However, they may not be optimal for studies that aim to detect socialization influences. For example, a child who is connected to just one or two members of a larger group will likely be excluded and potential influences can only be detected among the well-
connected members. Similarly, when a child is a member of multiple groups at the same time, decisions are required to assign this child to his or her most cohesive group and to disregard the other connections. This is justified when the goal is to describe overall structures, but when social influences are of concern, exclusion of partners can lead to exclusion of influences.

**Social consensus.** Because robust techniques to make sense of the “abstract art” of Moreno-type sociograms do not exist (Cairns, 1983, p. 432), many researchers have shifted their focus towards *social consensus*. Contemporary sociometric researchers use shared opinions (votes) of all of the children in a setting (i.e., whether a classmate is overall liked or disliked, or both, or neither) to determine the “group” to which a specific child belongs (e.g., Asher & Coie, 1990). Some network researchers have adopted similar strategies. Social crowds (e.g., “brains,” “nerds,” or “popular kids”; Brown, 1999) have similarly been defined as groups of people for whom social consensus exists with regard to key characteristics. Although use of social verdicts minimizes problems with reliability and participation rates, it can also change the definition of a group. “Groups” that represent social categories of (e.g., of rejected children) differ from groups defined by social interactions among members. Many members of sociometric “groups” may not share affiliations and may have few, if any, social interactions. Processes of influence are likely to differ as well. In the current chapter, the terms *peer group* and *social network* will be reserved for groups of children whose members share frequent contact and interactions.

**Observer-reports and Socio-Cognitive Maps.** Cairns, Perrin and Cairns (1985) have developed an approach called *Socio-Cognitive Mapping* (SCM) that also relies on assumptions of social consensus but follows the example of observational research. Observations of interactions have long been favored for identifying natural affiliations (e.g., Gest, Farmer, Cairns & Xie, 2003; Strayer & Santos, 1996), but they are costly and have design problems of their own (e.g.,
representativeness across situations). SCM employs children themselves as **expert observers** because children have access to information about natural affiliations in a way that cannot be easily matched by trained observers. Multiple children in a classroom are asked to report about classmates whom they see to frequently “hang around” with one another. From these reports, composite maps are formed of the networks on which reporters agree (see Figure 1). One strength of the approach is that observers’ level of agreement can be determined; SCM Maps have been shown to be consistent with independent observations (e.g., Gest, et al., 2003). A second strength is that if public consensus exists, not every student in a classroom needs to participate. When the sample of reporters is fairly representative for a setting, reports from slightly more than half of its members seem to be sufficient (Cairns & Cairns, 1994).

**Empirical Examples**

Results from two studies will demonstrate how SCM strategies can be used to identify natural peer networks (see Table 1). Study 1 focused on four classrooms of fourth and fifth graders (Kindermann, 1993). Students were from a lower-middle to middle class economic background, almost equally divided by grade, classroom, and sex. Study 2 focused on an entire cohort of sixth graders in a rural/suburban town during their first year of Middle School (Kindermann, 2007). This school was the town’s only public school for this age range.

**Peer networks.** Networks were assessed via Socio-Cognitive Mapping (Cairns, et al., 1985). Study 1 used individual interviews (following Cairns, Gariépy & Kindermann, 1990; Kindermann, 1996); Study 2 used questionnaires in which children listed groups of students in their grade whom they knew to “hang out” with one another. Students were asked to list as many groups
Figure 1.

Subset of a Composite Socio-Cognitive Map of 6th graders’ social networks in a small town (the entire map can be viewed at www psy pdx edu/thomas/Research)
and members as they knew, to include dyads, to include themselves, and to include the same children as members of different groups if appropriate. A typical report denotes, for example, children A, B, and C to form one group, and D and E to form another.

At the beginning of fourth and fifth grade (Study 1), 57 students were interviewed (52% of the sample, equally divided across gender and classrooms); at the end of the school year, 25 children from one fourth-grade class were re-interviewed. At the beginning of sixth grade (Study 2), 280 students (76% of the population in the town; 56% were girls) provided information about networks in their grade, and 219 students participated at the end of the school year. For descriptive purposes, these students were also asked to give nominated peer groups names that characterized “what the group was about” and “made” the people a group. In addition, they were asked about their three best friends in class, in school, and outside of school. The goal was to capture peer relationships of students who would not be members of peer networks because they were not known well enough or only shared relationships that were not publicly known.

**Network identification.** To identify groups, the nominations were arranged in a co-occurrence matrix containing the frequencies with which each child was nominated to belong to the same group as any other child. A portion of the matrix from Study 2 is presented in Table 2. Binomial z-tests examined whether each child was more likely to be nominated as being in a group with any other candidate than could be expected by chance (NETWORKS, Kindermann & Kwee, 1995). For example, across all 36 reports in which KER was nominated to have a group, RYB was noted 28 times in the same group (78%). Overall, RYB was nominated in 32 of the 694 reported groups. The conditional probability of finding RYB in KER’s network, given that KER had a group (28/36 = .78), was compared with the unconditional probability with which RYB was found in any group at all (32/694 = .05). The significant z-score of 21.47 identifies RYB as a member of KER’s
group. Because of many cases with low expected cell frequencies, Fisher’s exact test was used in addition (see Kindermann, 1993). Only connections were accepted that were significant \( p < .01 \) when using both strategies. Significant connections based on single co-nominations were not accepted; in most cases, these were children’s self-nominations.

**Results.** The resulting *composite social maps* depict all significant network connections; Figure 1 shows a portion of the sixth grade map; individual placements are arbitrary and based on drawing convenience only. As a criterion of accurateness, kappa indices (Gest, et al., 2003) showed that individuals’ reports were consistent with the composite map (average kappa was .88 in sixth grade and .70 in fourth grade; the lower consistency in the earlier study may have been due to the smaller number of participants). Only errors of commission were considered. Errors of omission were excluded because it is unrealistic to expect that all students would know the same amount about all networks (e.g., girls may know less about boys’ groups). As expected, the map of the entire cohort was complex; many networks bridged across classrooms. At the beginning of sixth grade, 80% (293) of the students were identified as members of social networks and a typical student was connected to 4.9 others (ranging from 0 to 17 members, 73% had networks larger than dyads). In Study 1 on fourth and fifth graders, 88% were members of networks and a student had 2.2 group members; the smaller group size is likely a result of the fact that this study was classroom-based and did not include affiliations across classrooms.

For illustration, Figure 1 includes children’s reciprocal friendships (boldfaced ties denote friendships matched by SCM affiliations, dashed lines denote friendships outside of peer groups; the entire map can be viewed at www psy.pdx.edu/~thomas/Research), as well as the names that children gave to nominated groups (with frequencies > 2). Students with large networks were typically simultaneous members of several crowds. For example, KER, RYB, and COD (lower right
corner) were members of a “cool” crowd; the male student RYB was also a member of a group of a female group of “jocks”, and COD was also a member of groups of “nerds” and “in-betweeners”. (All three were additionally members of a large crowd of “friends”). Large crowds of “cool”

Table 2

Co-occurrence matrix among a subset of girls in a cohort of sixth graders.

<table>
<thead>
<tr>
<th></th>
<th>KER</th>
<th>RYB</th>
<th>DAL</th>
<th>COD</th>
<th>SUO</th>
<th>ROM</th>
<th>STQ</th>
<th>CH</th>
<th>KAA</th>
<th>KAW</th>
<th>ELT</th>
<th>JE</th>
<th>LIP</th>
<th>Nominations</th>
</tr>
</thead>
<tbody>
<tr>
<td>KER</td>
<td></td>
<td>28</td>
<td>23</td>
<td>12</td>
<td>10</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>36</td>
</tr>
<tr>
<td>RYB</td>
<td>28</td>
<td></td>
<td>20</td>
<td>11</td>
<td>12</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>DAL</td>
<td>23</td>
<td>20</td>
<td></td>
<td>9</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>COD</td>
<td>12</td>
<td>11</td>
<td>10</td>
<td></td>
<td>8</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>SUO</td>
<td>10</td>
<td>12</td>
<td>9</td>
<td>19</td>
<td></td>
<td>9</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>29</td>
</tr>
<tr>
<td>ROM</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>8</td>
<td>9</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>STQ</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>13</td>
<td>10</td>
<td>4</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>CHR</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>KAA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td></td>
<td>13</td>
<td>13</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>KAW</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>13</td>
<td></td>
<td>13</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>ELT</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>13</td>
<td>13</td>
<td></td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>JEP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>LIP</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

N: 280
Informants: 280
Total nominations: 3047
N of Groups: 694
Generated

Note: Total nominations are necessarily smaller than the sums of co-nominations. Boldfaced cells denote significant co-nominations (p < .01)

students or “nerds” tended to bridge between otherwise separate groups. For example, among the six separate crowds of “nerds” and “geeks” in the cohort, two provided the main connection
Summary. SCM strategies can be used in small studies of selected classrooms as well as in studies of social systems. Cohort-based studies can yield maps that are complex, with groups that are highly interconnected and overlapping. Nevertheless, SCM networks may not always capture all of a child’s peer relationships. Because SCM networks focus on public knowledge, such networks tend to not include reciprocal friendships that are more private in nature.

How Can the Characteristics of Children’s Peer Groups Be Captured?

The second challenge to studying peer group influences is to specify and assess the peers’ potentially influential features. This involves two questions: First, how should groups be defined in complex composite maps and which key characteristics need to be assessed? Second, after decisions have been made about which kinds of groups can be identified: How should their psychologically relevant attributes be measured?

Individuals and their Groups

Because natural peer groups are (largely) self-selected, they tend to be fuzzy and overlapping, and a child can be a member of several different sub-groups at the same time. In Figure 1, student KER (lower right corner) has eight members in her peer network, while COD has 14; many members are shared but many others are not. For examinations of social influences from such groups, it will make a difference how social networks are defined.

Decisions about “Group-ness”. Assumptions about the kinds of groups that exist influence the groups that will be identified. Two general strategies can be followed: One follows the premise that groups should be distinct whereas the other assumes that separate groups exist only in exceptional cases. Likely, the best guide in the search for group structures is the nature of the phenomenon under study. When research questions require the identification of distinct groups that
do not overlap, the main goal is to reduce overall complexity and to define boundaries in parsimonious ways (e.g., in sociological studies, Bearman, Moody, & Stovel, 2004). Typically, such decisions are based on graph-theoretical considerations (e.g., when using NEGOPY or UCINET) or on decision rules for group inclusiveness (Cairns et al., 1990). However, increased clarity may come at a cost. Decisions to reduce complexity affect the nature of the groups: Some affiliations are considered to be more important while others are ignored. When questions are about group socialization processes, decisions may exaggerate differences between groups (because only individuals are included who are well embedded in groups), and may also lead to underestimations of group influences (because only the most homogeneous and cohesive sub-units are considered). Excluding partners excludes their potential influences. For example, in Figure 1, COD is a member of several “groups” at the same time. Graph theoretical decisions would likely exclude MEK and COR (and probably also KER), because they do not share most of their connections with the other members of COD’s group.

When socialization influences are concerned, it seems preferable to consider all affiliates (unless theoretical expectations suggest that specific members be excluded). One option is to define a “group” individually, with respect to each specific individual, so that socialization processes are assumed to take place between each individual and all of the others who are identified as his or her frequent interaction partners. Figure 2 shows an example. Student COD is assumed to have her individual network, consisting of all the others with whom she shares a connection. This has one advantage. Traditionally, groups are assumed to exist on a conceptual level above individuals, on a higher level of organization, and the group context is assumed to be the same for each member. Researchers have become skeptical of such assumptions in the family literature (e.g., the family environment may not be the same for every child; see Harris, 1998), and skepticism may also be
helpful with regard to peer groups. Instead of assuming that socialization contexts are the same for
all group members, each member can be seen as having his or her own unique network. Thus, if a
girl is in a group with two boys, she will be influenced by children of the other sex, while the boys
share mixed-sex interactions. Then, socialization influences can differ even among members of the
same group.

**Group profiles.** The traditional method for forming accounts of groups’ psychological
characteristics has been to ask children themselves about their groups. However, individuals and
their descriptions of affiliates are not independent of each other. Not surprisingly, children’s self-
reports about peer contexts are typically closely related to reports about their own characteristics,
and inferring influences from such similarities is problematic. Correlations may indicate influences,
but they may also indicate the reverse, namely, that children’s own characteristics shape their
perceptions of affiliates. In contrast, when groups are defined independently of people’s own
perceptions, the psychological characteristics of groups can be assessed independently as well. In
the example of Figure 2, peers can describe their own characteristics (or other reporters, like
teachers, can give descriptions), and the descriptions can be aggregated across each child’s network
to form composite group profiles. Typically, researchers have used *group averages* (e.g.,
Kindermann, 1993; Kurdek & Sinclair, 2000). When groups are fairly homogeneous, averages
across members can be assumed to capture their central characteristics.

**Assortativeness: Selection processes and group homogeneity.** Peer groups are typically not
formed at random. Children seem to have assortative preferences with regard to a variety of
individual characteristics, and school motivation seems to be one of these (e.g., Epstein, 1983;
Kindermann, 2003). Preferences can also extend to a variety of other characteristics (e.g., gender,
IQ, achievement, grades; e.g., Hamm, 2000). For example, girls mainly form groups with other girls
during most of their school years (and boys with boys), and girls tend to be more motivated and to often show higher achievement (e.g., Eccles, Wigfield, & Schiefele, 1998). When girls generally perform better in school over time, only part of this should be due to their peer groups.

Assortativeness also has implications beyond individuals. Selection preferences may extend to characteristics of groups (group size, homogeneity), and when children affiliate who share similar experiences, members of a group may also be similar with regard to influences from outside the groups. Thus, members of a group may experience similar levels of stimulation and parental involvement at home (e.g., Fletcher, Darling, Steinberg, & Dornbusch, 1995), and similarity in home environments, at least for some children, may be a selection criterion. Such assumptions also pertain to teachers; children may form groups with others who are perceived similarly by teachers.
or who share similarities in their own perceptions. When indicators of the central characteristics of groups are formed, it is important to examine group homogeneity in these features, because selection preferences may overshadow actual influences from the groups.

**Empirical Examples**

In Study 1, 109 children from two 4th grade and two 5th grade classrooms participated in questionnaire assessments (96% of students in the classes). In Study 2, 340 sixth grade students participated (93% of students in the town), as well as their 13 homeroom teachers. As a measure of school motivation, student and teacher reports of students’ classroom engagement were obtained at two time points within the first three months of the school year and within three months of its end. The focus was on engagement because it is a characteristic that is highly valued in this setting and openly observable by students and classmates (Fredricks, Blumenfeld, & Paris, 2004; Skinner, Zimmer-Gembeck & Connell, 1998). The construct consists of the two components of behavioral and emotional engagement; parallel forms exist for assessments via self- or teacher-reports (e.g., “I try as hard as I can in school”; “In my class, this student tries hard”). Study 1 used the 10-item self-report measure of behavioral engagement; Study 2 used the parallel 14-item scale tapping teachers’ perceptions of students’ engagement (Wellborn, 1991).

In addition, at the beginning of the school year, students reported on the extent to which they experienced differential levels of teacher and parent involvement. The teacher measure consists of eight items tapping perceptions of availability, caring, warmth and affection (e.g., “My teacher knows me well”; Skinner & Belmont, 1993). The parent measure consists of 16 items tapping perceptions of warmth (e.g., “My parents understand me very well”) and rejection (e.g., “Sometimes I wonder whether my parents like me”). In previous studies, the measures showed
moderate correlations with student engagement, academic competence, and achievement (Skinner, Wellborn & Connell, 1990; Skinner, Johnson, & Snyder, 2005). Finally, as a measure of academic achievement, students’ mathematics grades were obtained from the end of fifth and sixth grade (both grades were averaged). Mathematics grades were used because they were assumed to be a close approximation of students’ ability, and, compared to other grades, less directly affected by levels of classroom engagement.

Descriptors of network characteristics. Composite group profiles were formed as markers of the motivational characteristics of peer groups. Scores were calculated by averaging the individual engagement scores across the members of each child’s group. Because of the large sample in the Study 2, it was also possible to examine details in the networks’ composition. The number of members in a student’s group was used to indicate network size. To indicate group homogeneity, the percentage of group members was computed who were students of the same gender, in the same homeroom, and the same grade. The (absolute) difference between a child’s own engagement score and his or her group’s composite was taken as an indicator of within-group homogeneity in engagement. Finally, the number of students with whom a student maintained group ties across the school year was taken as an indicator of network stability.

Results. The description of the relations between children’s own characteristics and those of their peer networks will mostly be based on Study 2; interrelations are more reliable with the larger sample. For the correlational analyses, SEM (AMOS 5, Arbuckle, 2003) was used and missing values were estimated using Full Information Maximum Likelihood estimation (FIML). Thus, the overall N is 366 for the cohort; exceptions will be noted. In both studies, students were highly motivated (M = 2.9 and 3.3 on the four-point scales), and motivation remained stable across the school years (.74 and .75, p < .001). In both studies, girls were more motivated than boys, but did
not change differentially. There were no differences in engagement between students who participated in the network assessments and students who did not.

**Member selection preferences.** Students were expected to be similar to the members of their groups. It was not expected that children would directly seek out candidates according to their motivation, but rather, that selection processes would target similarities in a wide range of characteristics that would be differentially compatible with a focus on academic work. Thus, group homogeneity was assumed to be a by-product of selection processes that followed inter-individually different criteria. At the beginning of the school year, students were found to be moderately similar to the members of their groups; highly engaged students were members of groups that had similarly high engagement profiles (Study 1: \( r = .28, p < .01 \), Study 2: \( r = .44, p < .001 \)). The large sample in Study 2 made it possible to examine assortative preferences. Within-group similarities in age, gender, and classroom location were pronounced; on average, 98% of a child’s group members were also sixth graders, 94% were of the same gender (80% of networks were gender-homogenous), and 60% were classmates from the same homeroom.

Students’ own levels of motivation were related to several properties of their networks, suggesting that differently engaged students had differing member preferences: Highly engaged children tended to affiliate with networks that were larger (\( r = .22, p < .001 \)) and gender-homogeneous (\( r = .22, p < .001 \)), and with networks that remained more stable across time (\( r = .16, p < .05 \)). In addition, selection preferences were also suggested by relations between network profiles and children’s own characteristics: Members of highly engaged networks tended to be higher achieving (\( r = .36, p < .001 \)), were more likely girls (\( r = .22, p < .001 \)), and tended to perceive their teachers (\( r = .23, p < .001 \)) and parents (\( r = .15, p < .05 \)) as more involved. Finally, group homogeneity in terms of engagement (absolute differences between individuals’ own scores
and their groups’ scores) was also related to members’ characteristics: Students who were more similar to their group were more engaged ($r = .22, p < .001$), higher achieving ($r = .21, p < .01$), and perceived teachers (but not parents) to be more involved ($r = .20, p < .01$).

**Member selection across time.** Following Kandel (1978), it is wise to assume that most of the similarity between children and the members of their networks are not the result of social influence, but rather due to member selection processes. Thus, the similarity between individuals and the members of their peer groups should mainly be taken as an outcome of peer selection. When selection processes continue across time, children’s selection criteria can change, based on experiences within and outside of groups, but it is also possible that some selection criteria remain the same. Continuity would be indicated if the motivational composition of children’s networks remained consistent over time and if children’s group characteristics continued to be related to their own classroom engagement at both times.

**Stability** of network memberships was moderate in both studies. An average fourth or fifth grade child maintained ties with 50% of his or her (2.2) initial peer group members. An average sixth grader maintained ties with three (61%) of his or her five initial members (range 0 to 11); 25% of the children lost network connections to all of their earlier affiliates, and 50% lost connections to at least half of their members (conversely, 50% of the students without a Fall network had formed new affiliations in Spring.) Only 19% of the sixth graders remained with entirely stable networks. Nevertheless, group homogeneity persisted over time in both studies, as indicated by significant continuity of the motivational composition of the networks (fourth grade $r = .47, p < .05, n = 25$; sixth grade: $r = .42, p < .001$). Thus, member turnover occurred in a way that did not affect much of the groups’ motivational characteristics, and one can expect that influences from peer groups may also be somewhat consistent across time.
Study 1 also examined a specific model of member selection. Patterson, Littman and Bricker (1967) have suggested a “shopping” model of how adolescents search for candidates for relationships. The model was adapted with the assumption that over time, children would tend to optimize their peer group membership. It was expected that children’s own levels of engagement at the beginning of the school year would predict how their groups’ engagement profiles changed across the year. Two indices were used: A selection index denoted the number of newly gained peer group members at the end of the school year; an elimination index denoted the number of group members lost over time. In the one classroom examined (n = 25), students’ own initial engagement was related to changes in their groups’ motivational composition when children’s scores were weighted with the number of peers newly gained across time ($\beta = .37, t = 2.42, p < .05$). This indicates that highly motivated children, especially when they acquired many new ties, were affiliated with peer networks that changed in a positive direction over time (and vice versa).

**Gauging the potential for peer network influences.** Person-to-group similarity can be an outcome of three processes: Member selection (e.g., according to similarity), social influences from group members, and influences from outside of a child’s group. The time-lagged assessments in Study 2 make it possible to assess the extent to which the peer processes uniquely contributed to children’s engagement scores at the end of the school year. Figure 3 shows the respective model. The engagement levels of children’s group members in Fall were predictive of their engagement in Spring, even when competing processes were controlled. The first set of assortativeness controls focused on individual characteristics, namely, children’s sex (because of gender differences in motivation), and academic achievement (because students with higher academic ability had more engaged networks). Both variables were significant predictors of engagement. The second set of controls addressed group characteristics, namely, the size of peer networks (because larger groups
consisted of more motivated members), their stability (because stable networks were typically more engaged), homogeneity in the groups’ gender-composition (because of preferences for same-sex affiliates) and similarity in engagement between children and the members of their groups (because children who were more similar to their group tended to be more engaged). These variables did not contribute significantly.

A third set of controls addressed the extent to which the engagement outcomes can be results of influences of involvement from teachers and parents. Separate regressions showed that teacher and parent involvement were both predictors of child engagement at the end of the school year ($\beta = .37, t = 5.95, p < .001$; and $\beta = .30, t = 4.66, p < .001$). When teacher and parent scores were combined, teacher involvement continued to be a predictor, but at the expense of parent involvement. Thus, both scores were summed as an indicator of adult involvement, which showed a strong contribution to Spring engagement.

Overall, children’s group profiles remained significant predictors of their own resulting classroom engagement, over and above the contributions of the controls. The entire variable set explained about half (47%) of the variance in children’s Spring engagement; the data fit the model very well ($\chi^2 (15) = 19.005, p = .214$; CMIN/DF = 1.267, CFI = .996, RMSEA = .027; 90% confidence interval .000 to .059), and nested comparisons showed that all network variables together explained about 24% of the variance in Spring engagement, and that Fall peer group profiles accounted for slightly more than half of this percentage. On the one hand, this confirms expectations that about half of the similarity between children and their groups is an outcome of selection processes (e.g., Hamm, 2000; Kandel, 1978). On the other hand, the cross-lagged analysis focuses on engagement outcomes, not individual change, and identifies similarities between earlier network profiles and children’s own later engagement. Some of this similarity denotes socialization
influences, but some should be due to the fact that children change in a way that is consistent with their past behavior. When groups are expected to influence children’s behavior, estimates of peer group influence need to examine group effects on children’s change.

Figure 3. Structural equation model predicting students’ engagement at the end of 6th grade (Kindermann, 2007)
Summary. The findings are consistent with those of other studies (e.g., Epstein, 1983, Hamm, 2000; Kandel, 1978) and suggest that about half of the similarity between children and their group affiliates was due to peer selection processes. There were many indications for interindividual differences in selection processes, and there were some indications that selection processes lead to moderate motivational continuity in peer networks. Despite the fact that half or more of the members a child’s peer network were exchanged across the school year, there was moderate stability in the motivational make-up of the groups. Overall, it seems unlikely that peer socialization processes will be able to account for more than 15% of the variance in children’s resulting engagement scores. When peer socialization processes are examined, analyses need to include children’s earlier (Fall) engagement as a control, and when children serve as their own controls, their own past behavior will be most predictive of their later behavior. Thus, actual socialization effects will likely be smaller than suggested by the cross-lagged effects.

How Should Peer Influences be Conceptualized and Examined?

The third challenge is how influences from children’s peer networks should be conceptualized. Historically, such influences have been conceived of as socialization processes, and they are indicated when the characteristics of a child’s peer group at one point in time influence this child’s development across time. The concept dominated the psychology literature between the late 1940s and 1970s (Bronfenbrenner, 1994), but since then has almost “gone out of fashion” (p. xi). Traditionally, the concept implied that influence was unidirectional, from a socialization agent to a child, and that influences would “make” a child similar to a socialization ideal, the socialization agent, or to a group of others who are influenced by the same socialization agents. With peer relationships, socialization agents are other children who have the same characteristics as target children under study, and influences can occur simultaneously from each member of a group to any
other member. There is typically not much of a socialization ideal or socialization goal, and similarity may be primarily what leads children to select peers as members of their peer groups. It seems advantageous to use the term socialization to refer to processes by which social interactions are \textit{actively changing} something about a person, and to processes that can produce change in multiple directions. This perspective leads to three implications.

\textbf{Natural peer groups are characterized by Assortativeness.} Traditionally, peer selection has been seen as a “problem” for socialization studies (e.g., Kandel, 1978) and as a threat to interpretations of correlations in terms of social influence. However, selection processes are what constitutes social networks. Peer groups tend to be formed in such a way that children are similar to their affiliates, a characteristic also described as assortativeness. Over time, members of a group may follow similar developmental pathways just because they have something in common. Correlation patterns that look like peer “influences” may actually be outcomes of the fact that similar children have congregated. For example, children who are more accepted by their peers tend to adapt more favorably to school (e.g., Chen, et al., 2003). Popular children may have larger peer networks, and although their changes could be outcomes of peer influences, it is also possible that well-adjusted students have joined with similar students who all show positive change. To indicate socialization, predictions of children’s change need to remain robust when selection preferences are controlled.

\textbf{Assortativeness can exist with regard to third-party influences.} Because children in a group tend to share similar experiences; assortativeness can extend to external characteristics. \textit{Teacher involvement} may be the most powerful determinant of children’s classroom behavior (e.g., Skinner & Belmont, 1993). When teachers are effective in promoting “good” students’ development, and those students form groups with other “good” students, students’ change over
time may be a result of peer influence, but it may also be an outcome of teachers’ efforts. Similarly, parent involvement has also been implicated as a determinant of school success (e.g., Grolnick & Slowiaczek, 1994). It is possible that children’s home environments are primarily responsible for their change across time, while peer influences would add only little.

Because individuals and the members of their peer groups are interdependent, alternative processes need to be eliminated that can produce patterns of change that only resemble peer socialization. Because genuine peer group influences may exist in addition to these alternative pathways, it needs to be determined whether peer influences make independent contributions, over and above teachers’ and parents’ involvement. If they do, that does not necessarily mean that influences from adults were not important, but rather, that peer influences add something in addition. If they do not, that would not mean that peer influences were not important; they can be moderators of parental influences (e.g., Chen, Chang, He, & Liu, 2005). It would mean, though, that adult influences would be stronger than direct influences from peers.

**Peer influences do not necessarily produce similarities.** Traditionally, studies of group socialization have taken similarity (conformity) among group members as their primary target in experimental as well as naturalistic studies (e.g., Asch, 1955; Sherif, et al., 1961). Although convergence can be an indicator of group influence, it may be just one of several possible outcomes. For example, even Asch himself regarded his experimental findings as examples of the extent to which individuals show self-reliance and resistance to group pressures (Friend, Rafferty, & Bramel, 1990). It may be that researchers have too easily extended models of task groups towards natural groups that function differently (e.g., Levine & Moreland, 1998).

In fact, a focus on convergence interferes with the study of natural groups in three ways. First, homogeneity is *not a clear indicator* of influence; it indicates influence only when people are
randomly assigned to a group and cannot escape. Natural groups tend to show moderate homogeneity when they are formed and similarity may be the basis for their formation (e.g., Hamm, 2000; Kandel, 1978). Since natural groups tend to be fluid, it becomes hard if not impossible to distinguish group changes that are due to member turnover from changes due to member convergence, and analyses need to be restricted to stable members (i.e., “after selection has occurred,” Urberg, et al., 1997, p. 835). Likely, stable peer groups differ from groups that are not stable. Second, group convergence is hard to distinguish from regression to the mean when members with scores in the tail of the distribution become more similar to their groups’ average. The remedy is to include more than two measurement points, which exacerbates problems of participation rates because stable sub-groups will be small. Third, the focus on group convergence has lead researchers to “reify” groups and to assume that they are discrete units of analysis. This is warranted in cases of assigned groups, but since natural groups tend to be self-selected and fuzzy, a child can be a member of many groups at the same time (see Figure 1).

One can assume that the main outcome of peer affiliations is change, and change in different directions among the individuals who are members of a group (see also Mounts & Steinberg, 1995). Then, the question is whether changes in individuals can be predicted from the earlier characteristics of their group members. A specific model has been suggested for the study of motivation in school (Kindermann, 1993; 1996): Children who are initially “rich” (in terms of their own motivation as well as in terms of their affiliates) may become “richer” across the time they spend with their groups, whereas initially “poor” children would decline. This expectation does not imply that group influences would lead to uniform trends, but implies that group affiliations produce changes that can make children increasingly different from one another.

To extend socialization hypotheses beyond group convergence has several advantages. First,
intraindividual change in the members of a group can be examined as an outcome of the characteristics of the group; selection influences are not confounded with socialization because group homogeneity is not expected. Secondly, changes can still be expected to contribute to convergence, but within-group similarity is only one possible outcome and interpretations are not jeopardized (as much) by regression to the mean. Third, hypotheses can focus on differential change; influences from peer affiliates, at least in some circumstances, at some times, and for some children, may lead children to become different from one another. Theoretically, it appears hard to reconcile beliefs that intimate relationships that provide nurturance and mutual support with the expectation that they would produce uniform results in the form of a “social mold” (Cairns & Cairns, 1994). Favorable peer contexts may not just foster individual adjustment, they may also encourage increasing autonomy and differentiation (e.g., Deci & Ryan, 1985).

Empirical Examples

The studies were guided by an interactional perspective on development (e.g., Baltes 1996; Bronfenbrenner & Morris, 1998), and by the assumption that those peers would have most influence on development with whom a child spends most time interacting. Peer influences were examined in terms of the extent to which the motivational composition of a child’s group of peers allowed predictions of that child’s own change in motivation across the school year. Longitudinal designs were used to separate processes of peer influences from peer selection and from simultaneous influences from other socialization agents outside children’s peer groups.

Results. A first set of analyses used multiple regressions to examine whether change in children’s own engagement across the school year can be predicted from the characteristics of their earlier peer groups. The results converged across the two age ranges (Study 1: $\beta = .15, p < .01, n = 96$; Study 2: $\beta = .10, p < .01, n = 263$), across the group assessment formats (interviews versus
questionnaires), and across engagement measures (self- versus teacher-reports). Because Study 2 included an entire cohort of students in a town, its results should be most representative. Children who, at the beginning of the school year, were members of networks that had a higher than average level of motivation (who also tended to be more motivated themselves) remained themselves stable across time (3.30 and 3.29), whereas children who were with less motivated groups decreased in motivation (from 2.96 to 2.90, about 2% on the 4-point scale). Although the partial correlations were relatively small and matched by relatively small average changes, this does not mean that peer effects were negligible. Given the high stability of motivation, it is unlikely that changes would be large. Most children are “average”, have average peer groups and change only little across a year. There were, however, subsets of children in Study 2 for whom peer influences appeared more powerful: Peer groups explained 3% of the variance in engagement change when only students below the median were considered, and 13% when only the 41 students were considered who changed more than one standard deviation on the scale.

**Controls for assortativeness: Member selection and third-party influences.** Study 2 included additional analyses of the extent to which predictions of change remained robust when the assortativeness controls were included. When children select group members, it is possible that their own characteristics and the criteria they use to select members are better indicators of their developmental pathways than the engagement characteristics of their groups. Thus, the goal was to show that changes in children’s motivation can be predicted from the characteristics of their peer groups, over and above of the contributions of the selection controls, and over and above the simultaneously competing influences from teachers and parents.

Structural equation modeling (AMOS 5, Arbuckle, 2003) was used to determine whether children’s peer network characteristics predicted their own change in engagement over and above
controls; missing values were estimated using FIML. Figure 4 shows the results.

The data fit the model very well ($X^2 (23) = 22.660$, $p = .481$; CMIN/DF = .985, CFI = 1.00, RMSEA = .000, 90% confidence interval from .000 to .042), and peer group engagement profiles

Figure 4. Structural equation model of peer group influences on changes in students' engagement during 6th grade (Kindermann, 2007)
continued to be significant predictors of individuals’ change across time. In addition, sex was also a predictor of engagement change (girls showed more positive change when their groups’ engagement levels were held constant). Adult involvement and network size were also significant predictors. The other control variables were correlated with individual and group scores but not related to children’s changes in engagement.

**Summary.** Although the cross-lagged predictions (Figure 3) suggested effects that were relatively large and comparable to those found in traditional studies, peer group influences appeared to be smaller when the contributions of selection variables and influences from adults were included. In fact, compared to traditional analyses of peer socialization, the current analysis strategy has four features that make the results more conservative. First, because the target outcome is intraindividual change and not group homogeneity, effects of group selection are not confounded with estimates of socialization effects. Second, because children’s initial motivation is included as a control, relative person-to-group similarity is held constant. Third, the inclusion of the assortativeness variables makes the analysis quite robust against rival interpretations. Finally, because the expectation is that children with highly motivated groups would increase (and vice versa) the analyses are fairly safe against the effects of regression to the mean.

**How Sure Can We Be That Predictions of Change Indicate Causality?**

The studies suggest that children’s frequent interactions with peer groups in school have a small amount of influence on changes in their own classroom engagement over a school year. While this is encouraging, two further questions need to be addressed: First, is it really the engagement level of a child’s frequent interaction partners that is predictive of engagement change, or is it some other feature of this child’s relationships (e.g., friendships) that is only correlated with peer networks? Second, is it possible that peer affiliations are just diagnostically predictive of children’s path of
development, but not causal antecedents? To use an analogy, the weather report may be the single best predictor of the weather, but it is not at all a causal antecedent. A child’s peer affiliations may tell us what a child “is about” at a specific time, but predictive power does not necessarily imply causality.

**Peer Networks versus Friendships**

The studies were based on the premise that *frequency of interaction* would be the active ingredient of developmentally influential peer contexts. Although interaction frequency is considered a key force of development in many classical theories (e.g., attachment theories), it may not be all that matters. In his editorial for a special issue of the *International Journal of Behavior Development*, Laursen (2005) describes *close relationships* as the “building blocks of human culture” (p. 97), and friendship researchers assert that close relationships are most important to consider for developmental influences (e.g., Altermatt & Pomerantz, 2003; Berndt & Murphy, 2002; Gest, Graham-Berman, & Hartup, 2001; Ladd, Birch, & Buhs, 1999). It is possible that peer networks only appear influential because they contain many of a child’s close friends. Figure 1 (see the dashed lines) shows that many friendships in Study 2 were included among children’s groups of frequent interaction partners, while many others were not. Slightly more than half of a child’s reciprocal friends were members of his or her social network, but 70% of a child’s group members were not reciprocal friends. In short, relationship quality may boost the influence of peer groups, and the most important influences may be from those peers who are close to a child and who, at the same, time interact frequently with him or her.

One may see this as low “concordance” between different assessments of children’s peers. However, there may be more than one valid representation of a child’s social world, and children may have groups of frequent interaction partners, and, at the same time, friends who are not
publicly known. To make sure that the focus on frequent interaction partners was appropriate, an additional model in Study 2 included the engagement profiles of those students who were reciprocal friends of a child but not members of his or her peer group. The results showed that these friendship profiles did not contribute to changes in engagement, and that their inclusion had no effect on the fit of the model ($X^2(26) = 23.947, p = .579$, CMIN/DF = .921, CFI = 1.0, RMSEA = .000; $X^2(1)$ difference = 1.347). This suggests that groups of frequent interaction partners were most predictive of children’s change in engagement.

**Mechanisms of Social Influences Within Peer Networks**

Even in longitudinal designs, the question of whether peers are a causal antecedent for children’s change cannot be decided solely based on correlational evidence. Following Donald Baer’s suggestion for strategies of *convergent operations* (1973; Baltes, 1996), one can argue that experimental evidence clearly suggests that peer group contexts can influence children’s behavior in controlled conditions (e.g., Sherif, et al., 1961), but that it is unclear whether they normally do so in the classroom. Experimental analogies cannot easily show that natural affiliations, in which children select their partners, necessarily have the same effects. Conversely, the current correlational findings support notions that group influences may exist in the real world, but it is unclear whether group interactions are really causal antecedents or just diagnostic indicators of school motivation. In a third step, one needs to examine whether the same mechanisms can be identified in children’s natural interactions with peer groups that have been experimentally identified as producers of change. If such mechanisms can be found and if they are able to produce change over time that converges with the observed patterns of correlations, this would be supportive of a causal relationship. The weather report has no such mechanisms.

To study mechanisms requires observations in natural environments. Several studies have
documented that a variety of interactions (e.g., discussions, evaluative discourse, prosocial interchanges, learning contingencies) can be mechanisms of social influence in groups (e.g., Berndt, Laychak, & Park, 1990; Dishion, Andrews & Crosby, 1995; Hawley, Little, & Pasupathi, 2002; Wentzel et al., 2004). One such study (Sage & Kindermann, 1999) focused on learning contingencies in fifth graders’ classroom interactions. Across 10 days, 22 students in a classroom were observed by five trained observers. Children’s interactions were coded in the natural sequence of their occurrence by trained observers ($kappa = .71$), after students participated in an SCM assessment and the teacher provided ratings of their classroom engagement.

Sequential analyses (Bakeman & Quera, 1995) examined whether children’s on- and off-task behaviors in the classroom had different consequences when children were members of different networks. Results showed that the more engaged students were, the more likely they experienced contingent support for their (frequent) on-task behavior from the members of their (similarly engaged) peer groups ($\beta = .63, t(24) = 2.24, p < .05$), while non-members responded at random. Low motivated students had only the teacher as a source of support for their (less frequent) on-task behavior, and positive responses from their (low engaged) group members were rare and almost significantly inhibited. This indicates that contingency learning can be one mechanism of social influence that emanates from peer group interactions. The contingency patterns are consistent with the engagement changes found in the correlational studies. Over time, children who receive contingent support from the members of their networks will be likely to maintain their on-task behavior, and likely, this will lead them to maintain their overall engagement in the classroom.
Discussion

The chapter tried to carve out some territory between two extreme positions: one holding that the influence of peers is negligible and one arguing that peers are more influential than parents or teachers. Within this territory, a high priority is identifying the design features that allow studies to achieve accurate estimates of the extent to which naturally-existing peer groups influence individual children’s development. Four design features were suggested: Reliable and exhaustive identification of groups, longitudinal assessments, separation of selection and socialization analyses, and controls for the interdependent effects of individual, group-based, and group-external processes. These strategies should improve the ecological validity of the kinds of peer networks that are considered, as well as the precision with which potential socialization influences can be identified, thereby increasing the level of confidence with which we can infer social influences from correlational results. Taken together, these features can lend support to the contention that findings from such studies can safely be interpreted as socialization influences.

Group identification. Socio-Cognitive Mapping is a promising method for capturing naturally-occurring peer groups in real life settings. By focusing on public consensus about affiliations, peer groups can be identified objectively and reliably; 80% or more of the children under study were identified as members of social networks. SCM also makes it possible to overcome some of the problems with participation rates that occur with other strategies (e.g., Newcomb & Bagwell, 1995). However, researchers using SCM need to be aware of the fact that the method focuses on public consensus; students without social networks are not necessarily isolated at school. For example, although in the cohort of sixth graders, 20% of the children were found without a social network at school, many of them had nevertheless friends (and vice versa). SCM tends to underestimate connections that are private and not publicly known (e.g., in sixth grade,
many of the private friendships may denote emerging romantic relationships.) Conversely, friendship assessments can underestimate the extent to which children without friends are nevertheless well-embedded embedded in interaction networks. Similarly to other studies using SCM techniques, the majority of participants in Study 2 who were without reciprocal friends were nevertheless identified as members of peer networks.

**Socialization effects and their magnitude.** In addition to reliable and exhaustive identification of groups, the studies suggest three further design features that make it likely that findings accurately reflect social influences from peer groups. Students’ intra-individual change was the target outcome, peer group selection processes were disentangled from group influences, and controls were included for simultaneous influences from teachers and parents. What can be concluded from the studies about the effects of peer groups on children’s engagement in school?

On the one hand, the studies show that group influences on motivation exist over and above selection effects and over and above simultaneous influences from teachers and parents. Moreover, the findings appear to be robust across different populations. The current effects found in a rural town appear to converge well with those found in studies in a suburban school (Sage & Kindermann, 1999; average engagement level was 3.2) and in an inner-city school (Kindermann, McCollam & Gibson, 1996; average engagement level was 2.60).

On the other hand, when assortativeness controls were included, the magnitude of peer group effects was modest. Perhaps, this should not be too surprising. Several factors place constraints on the effects of peers. First, children with an average level of motivation tend to select average peers. Only children whose own levels of engagement deviate markedly from those of their peers should be influenced more. Secondly, peer influences contribute about 2% to the variance in changes in children’s motivation, whereas teachers and parents combined contribute about 4%
more. It may be wise not to overestimate the extent to which any specific context agent can affect children’s change. Unless student subgroups are identified who are particularly susceptible to peer influences, the strongest predictor of children’s engagement will always be their prior engagement, which includes the cumulative effects of a history of selection and socialization. Finally, there seems to be a pattern of continuous decline in children’s motivation across the years they spend in school (e.g., Fredricks et al., 2004). Most studies trace the path of only one school year. It is possible that peer group influences are small in any given year but accumulate across a child’s entire school career.

**Future Research on Mechanisms of Group Influences: Studies of Interacting Systems**

The focus of current studies converges with many theories in postulating that those social partners who interact most frequently with a child should be most influential, and it follows a perspective that social interactions are the “engine” of development (Bronfenbrenner & Morris, 1998). However, frequency of interaction may be just one of the determinants. Children’s close friendships may also contribute to changes in motivation. In the current analyses they did not, and this may be an outcome of the fact that most of a child’s friends were also among his or her frequent interaction partners. Nevertheless, researchers need to remain open to the possibility that different kinds of peer relationships may be differentially predictive of children’s development. Closeness and frequency of interaction may both need to be studied in combination, which would require the separation of SCM and friendship group profiles. In addition, these two kinds of affiliations may not be the only peer relationships that matter. For example, victimization researchers (e.g., Snyder et al., 2003) and antipathy researchers (Hodges & Card, 2003) point out that peers with whom a child has comparably little desire to spend time or form a relationship may nevertheless have profound influences on his or her experiences in school. The same may apply to
admired fellow students, even if there is not much interaction. If studies attempt to examine overall peer influences, relationships with other kinds of peers will need to be included.

Overall, research may move away from studies that show a net effect of peers, teachers, or parents on children’s development in school, and more in the direction of studies examining how all three kinds of partners form systems of influence for a specific child. The study of conjoint systems of influence and how these systems work in the real world is a relatively new field; guiding models still need to be developed (but see Fletcher et al., 1995; Hoglund & Leadbeater, 2004; Wentzel, 1998), but researchers should be encouraged to examine the interplay among simultaneous influences from peers, teachers, and parents. The current studies focused only on controls for potential simultaneous influences; future studies will want to focus on interconnected processes themselves. Such studies may be less concerned with the unique effects from peers or other partners, and more with questions about how influences from peers can work synergistically or antagonistically with influences that emerge from other partners.

Some recent studies show that the field is moving in this direction. Studies have begun to explore specific hypotheses about combinations of effects from multiple partners. For example, Chen and colleagues (2005), and Goldstein, Davis-Kean, and Eccles (2005) showed that peer affiliations can moderate how characteristics of parenting at home shape children’s social and academic pathways in school. Conversely, studies by Mounts and Steinberg (1995) and Pettit, Bates, Dodge, and Meece (1999) indicate that parenting practices can moderate influences from peers. Moreover, investigations have been begun to move one step further and to examine influences from teachers in combination with those from parents and peers (e.g., Ladd et al., 1999; Wentzel, 1998). For future studies incorporating the effects of children’s affiliations with peers on their development in school, this chapter aims to raise optimism about the importance of peers. At
the same time, it highlights some strategies for tackling the complex conceptual and empirical
issues of how to detect their effects in naturalistic studies.
Peer Networks and Social Influence in School

References


Kindermann, T. A. & Kwee R. (1995). NETWORKS (version 35.01) [Computer program]. Portland State University, Department of Psychology.


