

Empirical Article

How Do Naturally Existing Peer Groups Shape Children's Academic Development During Sixth Grade?

Thomas A. Kindermann and Ellen A. Skinner

This study examined whether peer groups can indirectly affect children's academic development in sixth grade (ages 11 to 13) by influencing their engagement in the classroom. From the entire cohort of 366 sixth graders in a town, 87% provided information at the beginning and end of the school year. Peer groups were assessed using Socio-Cognitive Mapping; as an indicator of motivation, teachers reported on students' classroom engagement. Achievement scores were averages of students' grades (summed across performance and effort scores in reading, writing, and mathematics) and achievement scores. Levels of classroom engagement within children's peer groups in the fall predicted children's own motivation at the same time, and, in turn, children's individual motivation scores predicted changes in their achievement over the school year. Implications are discussed for the cumulative effects of children's peer groups on their academic development during middle school.

Keywords:

Recent research has shown that children's naturally existing peer groups have modest influences on their academic development (Kindermann, 1993; 2007; Kindermann, McCollam & Gibson, 1996). More specifically, studies have mapped peer affiliations in the form of frequent and publicly observable interactions, and shown that groups' levels of engagement in learning activities shape how children themselves change in terms of their academic motivation over the course of a school year. Moreover, these effects are robust: They are maintained over and above the contributions of concurrent involvement from other important social partners, such as teachers and parents. Such peer group effects seem to be part of the motivational dynamics at school, in which children who are already "rich" in motivation at the beginning of the school year, by affiliating with peers who are more engaged, become even "richer" over time.

The current paper aims to take these studies one step further, and to examine, in a data set that included the entire cohort of sixth graders in a small town (Kindermann, 2007), whether influences from children's natural peer groups on classroom engagement would also translate into influences on academic achievement. Guided by an interactional perspective (Baltes, 1996; Bronfenbrenner & Morris, 1998), the study was based on the assumption that peers exert their influence in interactions. The studies used a specific method to reconstruct peer groups, *Socio-Cognitive Mapping* (SCM; Cairns, Perrin, & Cairns, 1985), which allows researchers to identify

the members of a child's peer group objectively, as publicly known affiliates, and to assess their characteristics independently from the information provided by individual children themselves.

Classroom Engagement vs. Disaffection

This program of research was guided by the assumption that peer group interactions would directly influence children's *engagement versus disaffection in the classroom* (Connell & Wellborn, 1991; Wellborn, 1991). Engagement was the key construct because it is central in current theories of motivation (Fredricks, Blumenfeld, & Paris, 2004; Jimerson, Campos, & Greif, 2003; Skinner, Kindermann, Connell & Wellborn, 2008; Wigfield, Eccles, Schiefele, Roeser & Davis-Kean, 2006) and because, as an observable manifestation of motivation, it is highly visible and salient to teachers and peers (Skinner & Belmont, 1993).

In the motivational conceptualization utilized for this research, engagement (also referred to as classroom participation or academic involvement) depicts student's energized, enthusiastic, emotionally positive, cognitively-focused interactions in academic activities in the classroom (Wellborn, 1991; Connell & Wellborn, 1991). At the core of the construct are markers of engaged behaviors, including effort exertion, trying hard, and persistence, as well as indicators of mental effort, such as attention and concentration. The conceptualization also includes engaged emotions, such as enthusiasm, interest, and enjoyment. The opposite of engagement is disaffection. Disaffected behaviors include passivity, lack of initiation, lack of effort, giving up, as well as mental withdrawal and ritualistic participation, such as lack of attention, pretending to pay attention, and going through the motions. Disaffected emotions reflect enervated, alienated, or pressured participation (e.g., sadness, boredom, anger, anxiety).

Research has shown that this kind of engagement in learning activities predicts children's achievement in and completion of school (e.g., Connell, Halpern-Felsher, Clifford, Crichlow, & Usinger, 1995; Connell, Spencer, & Aber, 1994; Skinner, Wellborn, & Connell, 1990; Skinner, Zimmer-Gembeck & Connell, 1998; for review, see Fredricks et al., 2004). Engagement is also hypothesized to be a key ingredient in the overall academic development of children and youth, since it likely influences their commitment to academic goals, ownership of their academic progress, self-regulated learning, and eventual identification with school (Finn, 1989).

Socio-Cognitive Mapping (SCM)

SCM employs children as *expert observers* of peer group interactions, because they have access to everyday exchanges in a way that cannot easily be matched by other observers. Multiple children in a classroom are asked to report about classmates whom they know to frequently "hang around" with one another, and composite maps are formed of the groups on which reporters agree. Similar to Moreno's (1934)

Sociograms, these maps depict the connections between children who share affiliations with one another (see Figure 1).

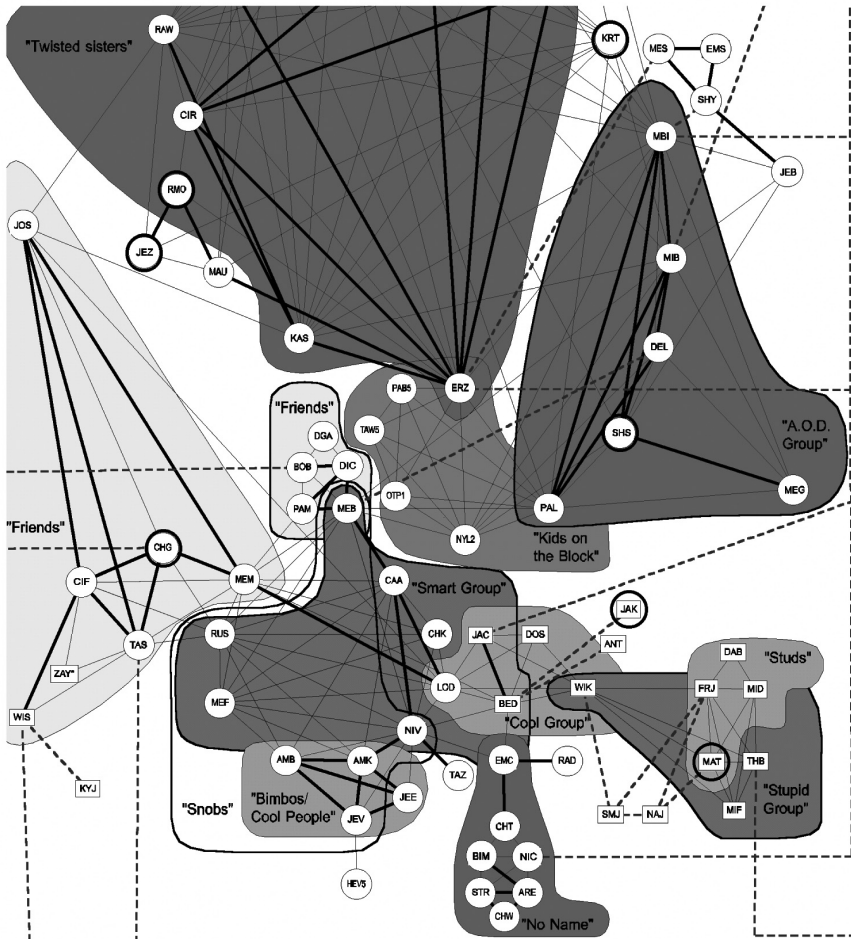


Figure 1. Subset of the composite Socio-Cognitive Map depicting girls in a cohort of sixth graders in a small town. Individual students' positions are arbitrary and based on drawing convenience only. Bolded circles denote girls who were frequently nominated (three times or more) as being "without a group". Group names are based on majority designations; in rare cases of strong in-group out-group differences, both respective names are included. Straight lines connect students who were known to frequently "hang out" with one another ($p < .01$); boldfaced lines connect students who also shared reciprocal friendships; dashed lines connect students who were just friends (only friends are included who were also in the neighborhood of the groups).

A strength of the approach is that group identification is based on multiple observers whose level of agreement can be determined (Gest, Farmer, Cairns, & Xie, 2003). A second advantage is that, compared to most assessments of peer relationships, the accuracy of SCM is not as dependent on participation rates. For example, when assessing reciprocal friends, each child who does not participate will also be missing as a (potential) friend of the remaining children. In SCM, not every student in a classroom needs to participate; if consensus is high and the sample of reporters is fairly representative for a setting, reports from slightly more than half of its members are sufficient to yield reliable maps (Cairns & Cairns, 1994).

In sum, the goal of this study was to build on previous research on naturally existing peer groups that focused on constructs of academic engagement, and to examine whether the effects of peer group engagement on the development of children's own motivation would also extend to the development of academic achievement across the school year.

Method

The study examined a cohort of sixth graders in a rural/suburban northeastern US town during the first year of middle school. This was the only public school in town for this age group.

Setting and Sample

Out of the total of 366 sixth graders (48% girls), 340 participated who had parental permission. In the school, students were grouped into homeroom classrooms; the intent was to have one teacher assigned to each class who was primarily responsible and saw the students every day. All 13 teachers participated and all stated that they were very familiar with the students, allowing them to provide accurate information about students' classroom engagement.

Design and Measures

Student and teacher questionnaires were administered within the first two months of the school year (October), and within two months of its end (May).

Academic engagement was assessed using a 14-item scale that tapped teachers' perceptions of students' behavioral and emotional engagement (Wellborn, 1991; e.g., "In my class, this student works as hard as he/she can"; "..., this student appears happy"). The two components are moderately intercorrelated, form an internally consistent and highly stable indicator of engagement, and are moderately correlated with grades and achievement (Skinner & Belmont, 1993; Skinner, et al., 1990; Skinner, Kindermann, & Furrer, 2008). In fall of sixth grade, teachers provided informa-

tion on 318 students (87% of the population); in spring, reports on 322 students were obtained. 300 students had assessments at both time points.

Achievement. Students' grades in mathematics and language arts were obtained at the beginning and the end of sixth grade. Letter grades (including pluses and minuses) for relevant school subjects and for effort were converted to numbers (i.e., F through A were converted to 0 through 11; e.g. B+ = 9) and all grades were averaged. As indicators of academic achievement, grade scores were averaged with students' standardized achievement scores.

Peer groups. In questionnaires, children were asked to list groups of students in their grade whom they knew to frequently "hang out" with each other. Students were asked to list as many groups and members as they knew (in school and outside), to include dyads, to include themselves, and to include the same children as members of different groups if appropriate (for example, a report could indicate that students A, B, and C form one group, at the same time that B and E form another). For purely descriptive purposes, children were also asked to give each group a name that characterized "what the group was about." More detailed descriptions of the method can be found elsewhere (e.g., Cairns, Gariépy, & Kindermann 1990; Kindermann, 1996).

Network identification. At the beginning of the year, 280 students (76% of the population) provided 3047 group nominations for a total of 694 groups (averaging 2.7 groups with 5 members). At the end of the school year, 219 students (60%) provided 3590 nominations for 664 groups (averaging 3 groups, 5.4 members). Using a variant of the program NETWORKS (Kindermann & Kwee, 1995), nominations were arranged in a *co-occurrence matrix* containing the frequencies with which each child was nominated to belong to the same group as every other child. Binomial z-tests examined whether children were more likely to be nominated as being together in a group than expected by chance ($p < .01$). Significant connections based on single nominations were not accepted because most were self-nominations.

The resulting *composite map* consists of all significant connections; a part of the map is presented as Figure 1. Kappa indices showed that individual reports were highly consistent with the map (average $\kappa = .88$). It should be noted that the method identifies children's connections with one another, not distinct groups. This has two advantages: Multiple group memberships are retained, so that a child can have connections that are not shared with the other members of his or her group; in addition, a child's group context is captured as specific for him or her; each child has his or her own peer group and interindividual differences in contexts can be examined.

Network characteristics. As markers of the engagement levels of children's groups, *composite group profiles* were formed, calculated by averaging engagement scores for all the members of each child's group(s). For example, the average engagement score of students JOS, CIF, TAS, RUS, and MEM in Figure 1 was taken as indicating the engagement level of CHG's peer network. Group names were not analyzed systematically, but name characteristics on which there was high consensus were examined for the extent to which these referred to larger crowds.

Results

Students were highly engaged ($M=3.08$) and fairly achieving ($M=8.73$); engagement was highly stable ($r=.75$, $p<.001$), and so was achievement ($r=.63$, $p<.001$). Girls were more engaged than boys ($M=3.20$ vs. 2.99 , $F(316, 1)=9.65$, $p<.05$), but their achievement did not differ significantly (M 's= 9.09 and 8.39). In the analyses, Missing values were estimated using a Full Information Maximum Likelihood procedure (FIML, AMOS 5, Arbuckle, 2003).

Social Networks. At the beginning of the school year, 293 students (80% of the cohort) were members of social networks. A typical student had 4.9 other children in his or her group (range 0 to 17). Students with large networks were typically simultaneous members of several crowds. Figure 1 gives an illustration using the names students gave to girls' groups (with $n>2$; the entire map can be viewed at www.psy.pdx.edu/~thomas/Research; for illustration, dyadic friendships are also included but were not analyzed here). Group names were not analyzed systematically, but they were used to generate the overall map (i.e., students who shared a common group name were drawn in proximity). In the analyses, groups were subjectively defined, so that CHG's group was the *set of all children* with whom she shared a connection.

Children's preferences for group members can be characterized using broad descriptors: 98% of a child's group members were also 6th graders, 94% had the *same gender*; 60% were from the *same homeroom*. Network stability was fair over the school year; a child maintained ties with three members (61%); 25% of students lost network connections to all affiliates, about 50% lost connections to at least half of their members, and 19% remained with entirely stable networks.

Table 1. Concurrent and Cross-Time Correlations.

	Achievement		Individual Engagement	Peer Group Engagement
	Fall	Spring	Fall	Fall
Achievement	Fall --	.66***	.70***	.48***
	Spring	--	.55***	.31***
Individual Engagement	Fall		--	.47***

Table 1 shows the intercorrelations between children's achievement scores, their own classroom engagement levels, and the engagement levels of the members of their peer groups. All three variables were highly intercorrelated. Most importantly, highly engaged and highly achieving children had peer groups whose members were similarly highly engaged and achieving, whereas children with low levels of engagement and achievement affiliated with peers who likewise had low levels of both. Similarity in academic characteristics was considered to be a key criterion around which peer groups would form. However, it was not expected that children would necessarily seek out candidates according to specific academic characteristics, but rather, that

selection processes would target similarities in a wider range of characteristics, only some of which would be compatible with a focus on academic work.

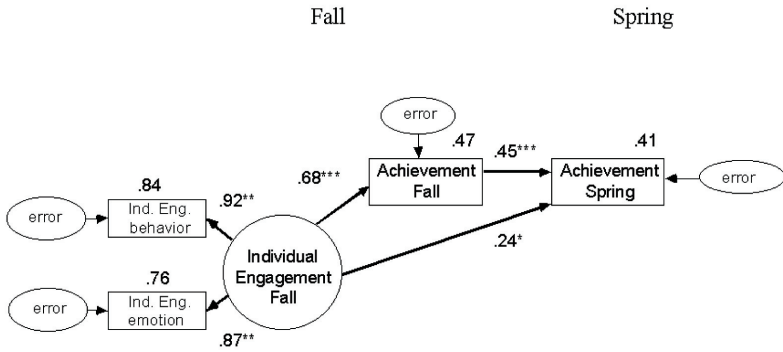
Peer Groups as Predictors of Change in Engagement and Achievement

Hypotheses about peer group effects focused on individual engagement as a mediator through which the levels of engagement of children's peer groups shaped their academic achievement. These analyses were conducted in two sets, the first examining the mediational effects of engagement on children's *concurrent* levels of achievement, and the second on *changes* in their achievement over the school year.

Concurrent mediational analyses. The first set of analyses, using standard tests of mediation (Baron & Kenny, 1986), focused on constructs from the fall of the school year only. Preliminary conditions for testing this model were met (see Table 1), namely, that the antecedent (in this case, peer engagement) was correlated with both (1) the outcome (i.e., achievement) and (2) the proposed mediator (i.e., individual engagement), and that (3) the proposed mediator was correlated with the outcome. The step of most interest was whether in models using both peer engagement (the antecedent) and individual engagement (the mediator) to predict achievement (the outcome), the unique effect of individual engagement (the mediator) remains significant whereas the unique effect of peer engagement (the antecedent) would be significantly reduced (indicating partial mediation) or no longer reach significance (indicating full mediation).

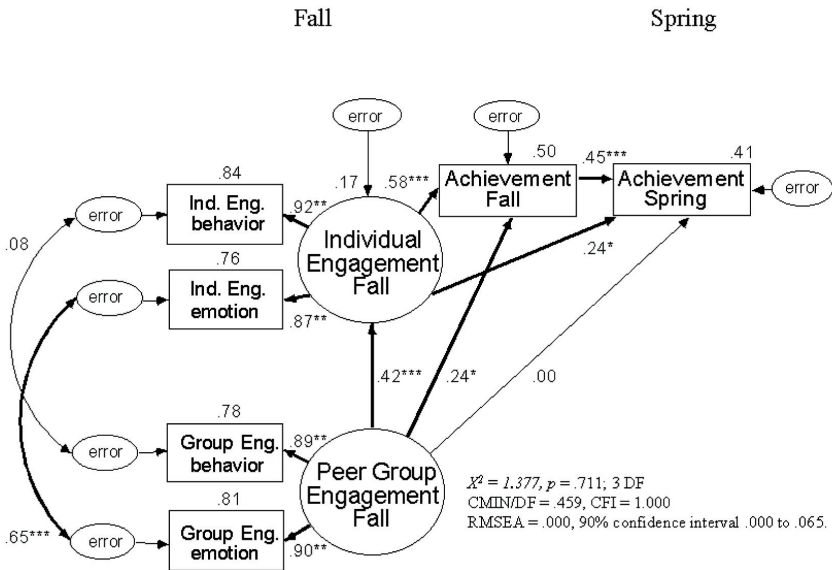
The concurrent model indicated partial mediation; the standardized coefficient linking peer engagement to achievement in the fall (i.e., $r=.48$, $p<.001$) was significantly reduced when individual engagement was added to the model, although it remained a significant unique predictor of achievement ($\beta=.23$, $p<.01$). Individual engagement, on the other hand, which was a strong predictor of concurrent achievement (i.e., $r=.70$, $p<.001$) remained a strong predictor even when peer engagement was added to the model ($\beta=.59$, $p<.001$). Hence, the standard method of examining mediation effects in concurrent data indicated that the effects of peer engagement on achievement were partially mediated by individual engagement.

Changes in achievement over the school year. The second set of analyses focused on *intraindividual change* as an outcome of the influences that group members exert on a child. These analyses proceeded in three steps. A first analysis examined whether change in children's achievement across the school year was predicted by their own initial levels of engagement. As can be seen in Figure 2, this was the case. Children who began middle school with higher levels of classroom engagement tended to show positive changes in achievement levels over time, whereas less engaged children tended to decline, $\chi^2(1)=.280$, $p<.597$; CMIN/DF=.280, CFI=1.00, RMSEA=.000, 90% confidence interval .000 to .112.



$\chi^2 = .280, p = .597; 1 \text{ DF}, \text{CMIN/DF} = .280, \text{CFI} = 1.00, \text{RMSEA} = .000, 90\% \text{ confidence interval } .000 \text{ to } .112.$

Figure 2. Individual engagement as a predictor of changes in achievement over the school year.



$\chi^2 = 1.377, p = .711; 3 \text{ DF}$
 $\text{CMIN/DF} = 459, \text{CFI} = 1.000$
 $\text{RMSEA} = .000, 90\% \text{ confidence interval } .000 \text{ to } .065.$

Figure 3. Peer group engagement profiles as predictors of concurrent individual engagement and of achievement changes over the school year.

The second analysis examined whether changes in children’s achievement could also be predicted from the engagement profiles of their peer groups at the beginning of the year. This was not the case. Perhaps this is not surprising; from an interactional

perspective, it is likely that the levels of engagement among child's peer group members influence that child's own engagement, and that this influence has only indirect effects on change in achievement.

The final analysis examined whether peer engagement profiles had *sequential influences* on achievement changes, through the pathway of energizing individuals' own engagement in the classroom. Figure 3 shows that peer group engagement profiles predicted concurrent individual engagement, which then predicted changes in achievement over time, $\chi^2(7)=3.68$, $p=.816$; CMIN/DF=.526, CFI=1.00, RMSEA=.000, 90% confidence interval .000 to .040 (model parameters did not change substantially when children's sex and network size were controlled). As a check on whether the pathway from peer engagement to individual engagement was needed, the current model was compared to one without this link. Comparison of the nested models revealed that the model containing the pathway from peer engagement to individual engagement provided a better fit to the data than a model without this pathway, $\chi^2(1)=45.31$, $p<.001$.

Discussion

The main goal of this study was to examine whether the effects of sixth graders' natural peer groups on their classroom engagement can translate into effects in the real world, namely, on changes in children's academic achievement, across the first year of middle school. Peer group profiles of engagement predicted students' own concurrent engagement, which, in turn, predicted changes in achievement from the fall to the spring of sixth grade. The study included the entire population of sixth grade students in a small town, used independent reporters of peer groups (consensus maps) and classroom engagement (teacher-report), relied on indicators of school engagement that are part of everyday social interactions in the classroom, and examined students' intra-individual change as the target outcome. Taken together, the findings suggest that one pathway through which peers can have an impact on a child's learning and cumulative academic achievement is through influences on that child's engagement in the classroom.

The models tested in this study revealed a slightly different mediational picture depending on whether the outcome examined was concurrent achievement or changes in achievement over the school year. For concurrent achievement, individual engagement partially mediated the effects of peer engagement, even though peer engagement remained a unique predictor. However, when changes in achievement were used as the target outcome, peer engagement did not emerge as a significant predictor. Its only role was to boost individual levels of engagement, which, in turn, had an effect on *changes* in achievement. Although the link from peer engagement to individual engagement was an important part of the model, peer engagement did not directly contribute to changes in achievement. It is likely that the high stability of children's achievement scores made it difficult for peer engagement to enter into the prediction. Only (teach-

er-ratings of) individual engagement was sufficiently tightly coupled to grades so that it could still predict achievement in spring controlling for achievement in fall.

The processes that were responsible for achievement changes were assumed to be recurring everyday interactions with differentially engaged peers. Future research could examine the exact ways in which peer engagement exerts its influences on individual engagement. A variety of mechanisms are possible: the classroom may be more fun if one is working with enthusiastic peers; peers' enjoyment of school activities may be contagious; peers who value school success may support one's own commitments to learning. In the same vein, multiple mechanisms by which peer disaffection promotes individual disaffection can also be imagined: Peers may distract children from classroom learning, or they may discourage or disparage their participation. Studies in which these mechanisms are directly observed (e.g., Sage & Kindermann, 1999), although time-consuming and difficult, would be especially valuable.

If, as suggested by the concurrent analyses, peer engagement makes a direct contribution to children's learning and success over and above its effects on individual engagement, then additional mechanisms will need to be investigated. One possibility is that peers may provide instrumental aid, by teaching or tutoring their friends, by helping them keep track of assignments, or by studying together. These supports would make individual children's efforts more effective, in terms of both learning and graded performances on homework, projects, and tests.

A more complete analysis of the social partners that shape children's academic development will also include other kinds of peers, like friends and classmates (for review, see, for example Bukowski & Cillessen, 1998; Rubin, Bukowski & Parker, 2006). It may also need to include adults, for example, teachers at school as well as parents and extended family members at home. Although previous research has shown that peer group members have a unique effect on the development of children's motivation over and above the effects of support from teachers and parents, it is nevertheless likely that the effects of these social partners interact with each other, creating synergistic or antagonistic social contexts for children's academic development. Some of methodological approaches employed in the present study, such as the measurement and design strategies used to capture the effects of peers on intraindividual change across time, as well as the focus on children's own engagement as a pathway through which social influences shape learning and achievement, can potentially be helpful in formulating future studies that explore the effects of multiple social partners on children's academic development.

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