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Social networks within classroom ecologies: peer effects on students' engagement in the context of relationships with teachers and parents

Thomas A. Kindermann · Justin W. Vollet

Abstract If researchers wish to understand how classroom ecologies influence children's learning at school, they will need to combine investigations of the effects of peer group networks with analyses of teachers' and parents' influences. One promising target outcome for such studies would be children's classroom engagement, because it is not only visible to peers and teachers at school, but is also apparent in children's academic activities at home. To study peer influences on engagement, socio-cognitive mapping strategies appear to be well suited, because they capture groups of peers who frequently interact with one another. Building on findings from several such studies of peer group effects, we expand the framework by incorporating influences from teachers and parents. We include preliminary analyses suggesting that peer influences are especially strong for children who do not experience much involvement from teachers and parents. Finally, we suggest that it would be beneficial if teachers were trained to keep track of peer group processes in their classrooms.

Keywords Peer groups · Classroom ecology · Motivation

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Soziale Netzwerke und die soziale Ökologie der Schulklasse: Der Einfluss von Peer-Gruppen auf das akademische Engagement von Schülern im Kontext ihrer Beziehungen mit Lehrern und Eltern

Zusammenfassung Forschung darüber, wie Schule als eine soziale Ökologie auf Lernprozesse Einfluss nimmt, erfordert es, Messungen über den sozialen Einfluss von Gleichaltrigen (Peer Gruppen) mit Messungen der Einflüsse von Lehrpersonal und Eltern zu kombinieren. Akademische Motivation in der Form von schulischem Engagement ist ein Konzept, das beschreibt, wie sich Motivation im Klassenraum manifestiert, und ist prinzipiell von Gleichaltrigen, Lehrpersonal und Eltern beinflussbar. Um Netzwerkeinflüsse auf Engagement zu untersuchen, erscheint die Methode des Socio-Cognitive Mapping vorteilhaft, da hierdurch Gruppen von Schülern identifiziert werden können, die besonders häufig miteinander interagieren. Ergebnisse von Studien über den Einfluss solcher sozialen Netzwerke werden vorgestellt und zusammengefasst. Zusätzlich werden tentative Analysen vorgestellt, die zeigen, wie Effekte sozialer Netzwerke durch gleichzeitige Einflüsse von Beziehungen mit Lehrpersonal und Eltern moderiert werden können. Einflüsse von Gruppen Gleichaltriger kommen stärker zur Geltung, wenn Schüler ihr Lehrpersonal oder ihre Eltern als nur wenig involviert beschreiben.

Schlüsselwörter Peer-gruppen · Klassenökologie · Schulmotivation

All cultures find it useful to organize children's formal education so that adults guide the learning of groups of children at the same time. The benefits of teaching children in groups extend beyond economic considerations, because students' interactions with peers tend to foster learning over and above the provisions of adult teachers. For many children, school is attractive precisely because their friends are present. In addition, learning how to get along with peers in an adult-organized setting may prepare children for the adult world of work, in which they will interact with colleagues (peers) who work on tasks designed by a supervisor.

Classrooms can be seen as *social ecologies*, and learning in school as a socially organized process (Farmer et al. 2011). This view extends traditional targets of educational research towards ecologically-oriented studies that explore social processes in the classroom (e.g., Eccles and Roeser 2010; Frank 1998; Wentzel 1998). Investigation of classroom ecologies, which examine how educational processes work, may lead to new insights for educational innovation. Figure 1 shows a schematization of how we view classroom ecologies. Although parents are usually not present, we explicitly include them because their relationships with children determine the resources students bring with them into the classroom.

The main goals of this paper are to describe and discuss empirical strategies that make it possible to examine how peer relationships interconnect with other relationships at school to jointly influence students' academic development. First, we review different strategies to study peer group influences at school. Secondly, following Bronfenbrenner's guidance, we consider the "invisible hand of the teacher" (Farmer et al. 2011), as well as how parental influences can permeate into the classroom (e.g.,

Fig. 1 The classroom ecology as a system of relationships and ineractions
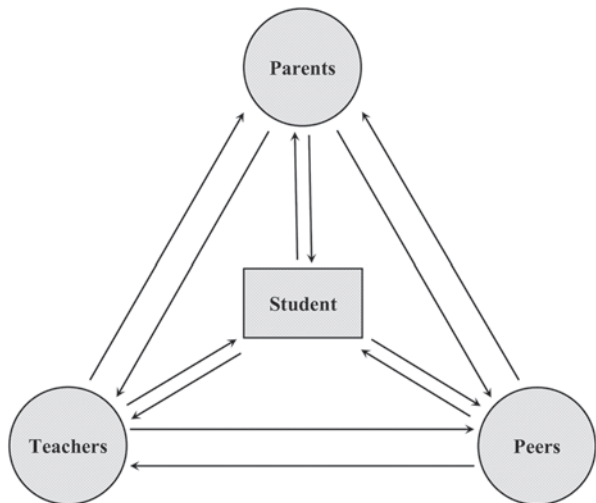
Fan and Chen 2001; Jeynes 2005; (Walper and Grgic 2013)). We also present preliminary analyses that aim to illustrate how the three influences are interconnected.

1 Networks of interpersonal relationships at school

Social network perspectives have enjoyed widespread attention, ever since Moreno's (1934) volume "Who shall survive"? The interest extends beyond school settings (e.g., Borgatti et al. 2009; Christakis and Fowler 2009), but as Heidler et al. (2014) pointed out, the first attempt to study networks empirically was actually conducted in a school. The basic assumption of network studies is that knowledge about social affiliations makes it possible to forecast how well students will fare in school over time.

Approaches to assessing social networks. Traditionally, studies of peer affiliations at school focus on identifying children's *friends,* typically by examining how pairs of individuals mutually nominate each other. Friendships are lasting intimate bonds, and there are many reasons why they should be influential (e.g., Altermatt and Pomerantz 2003; Berndt et al. 1999; Hallinan and Williams 1990). However, children's social worlds are more complex than friendship studies seem to suggest. Following Bronfenbrenner and Morris (1998), one can argue that the most important social influences involve those social partners with whom children interact most; some of these may be friends, but others may not.

Physical proximity is a critical determinant of social interactions. For example, studies have looked at students who take courses together (Crosnoe et al. 2008) or who sit close to one another during class (van den Berg et al. 2012). Social interactions also occur at lunch, in the schoolyard, and on the way to and from school. One method that aims to directly identify groups of students who spend much time together is that of *Socio-Cognitive Mapping* (SCM et al.; Cairns & Cairns 1994). Students themselves, considered "experts" on peer relationships in school, provide information about their

own peer groups as well as other groups they notice through everyday observations. In elementary school, reports are usually restricted to classroom interactions; in adolescence, the focus expands to entire grades or the whole school.

To give an example, student AMY reports she is in a peer group together with classmates BEA and CAM; she also notes that she is in a sports team with DEE, EVE, and FAY, and two children from different grades, GIN and HEA. In addition, AMY reports seeing a group of skateboarders at school, ARN, BOB, CAL, and DAN, and a group of girls who hang out at the mall: INA, JAN, KIM, and LEA. Other participants will confirm some of these observations and will add others of their own. In elementary school, interviews seem to be best for eliciting accurate information (Kindermann 1993), whereas questionnaires work well from middle school onwards (Kindermann 2007).

The main difference to friendship nomination strategies is that in SCM, students report about their own groups as well as about *other groups they know*. This seems to yield more complete network accounts when there are many non-participating students (who may be listed as friends but cannot reciprocate). Network completeness is important: If only a subsection of a social system is studied, network effects may appear stronger or weaker than if all social affiliations were included.

A second difference is that SCM identifies groups who are known to interact frequently (Gest and Kindermann 2012), whereas friendship nominations capture close and intimate relationships that may be private. Thus, groups identified with both methods are often not the same (Kindermann and Skinner 2012, reported about 50 % overlap; see also Rodkin and Ahn 2009). The third difference is an emphasis on reliability. SCM typically uses composite reliability as an indicator of the accuracy of network maps. In friendship studies, reliability can be considered by including only reciprocal friends (in which two friends agree), but often, little attention is paid to reliability.

Identifying peer groups. To identify groups, SCM reports are arranged in a co-occurrence matrix denoting the frequencies with which every child was observed as a member of every other child's group. Statistical tests are used to identify subgroups (e.g., binomial z-tests, examining whether the frequency of finding BEV in AMY's group, given that AMY had a group, was significantly higher than expected by chance, Kindermann 1993; or correlational strategies, e.g., Leung's 1998, SCM program, or factor analyses, Gest et al. 2007). Choice of strategy depends on the target research question. For example, if a study aims to identify non-overlapping groups in order to examine group differences, the SCM program or factor analytic strategies are best. If the goal is to preserve naturally-occurring overlap so all potentially influential agents can be identified, conditional probabilities seem preferable.

The composite maps depict all connections between children in a setting. As an example, a map of all 6th graders' interconnections in a small town (Kindermann 2007) can be viewed at http://web.pdx.edu/~thomas/. Note that because children report about themselves as well as about other students, maps contain both study participants and non-participants. Such information is useful for determining overall and average network size or social isolation.

2 What do peer groups influence? A perspective on academic motivation

An important question about peer effects in school involves specifying those individual characteristics that may be open to influence. It seems unlikely that peer groups would have much (direct) impact on academic outcomes (e.g., achievement). Influences are likely indirect, operating through the effects peers exert on key aspects of students' participation in school—their choice of classes (Crosnoe et al. 2008), experiences of which topics are enjoyed most, and decisions about how much effort will be exerted. A key candidate for a characteristic that can be directly influenced through peer interactions is *academic motivation* (e.g., Deci and Ryan 2000; Skinner et al. 1990). For example, working with peers on a class project can ignite students' enthusiasm, and this can spread across the group. In fact, several studies have shown peer effects on academic motivation (e.g., Altermatt and Pomerantz 2003; Berndt et al. 1999; Ryan 2001; Chen et al. 2003). From the perspective of this paper, the presence of peers is assumed to make academic tasks more (or less) enjoyable, which then may lead to changes in motivation, and eventually, changes in academic outcomes.

However, motivation is an intrapsychic concept. What peers can perceive and react to is how motivation *manifests* itself at school. This leads to focusing on motivated *behavior* and *emotions* that are visible to others. When a student is with highly motivated peers, he or she will explore, learn, and express emotions in a way that is different from students who are with less motivated peers. The processes should occur in group-work in the classroom, but also during volunteering, when choosing areas of study, during homework (groups), and also extend to extra-curricular activities (e.g., visits to museums). Eventually, changes in values, goals, and academic outcomes would result from interacting with academically engaged agemates.

In our studies, we have focused on the concept of *classroom engagement* (Skinner et al. 2009) as a measure of how academic motivation is manifest in the real world. High engagement, which can be captured by student-, teacher-, or observer-ratings, is denoted by effort, enthusiasm, interest, enjoyment, and persistence during academic activities; the opposite is disaffection, characterized by passivity, lack of initiation and effort, withdrawal, anger, sadness, and ritualistic participation. For peer group studies, we have mostly focused on teacher perceptions, assuming that what teachers observe would be highly similar to what students' peers can see.

3 How can influences from children's social networks be analyzed?

Detection of influences from peer groups requires longitudinal measurements that capture changes over time. Classical network tools, such as UCINET (Borgatti et al. 2002), are most useful for identifying network features at a given time point (e.g., centrality, density). For examining influences over time, there are three main analytic strategies. First, regression analyses and Structural Equation Models (SEMs) can examine the extent to which changes in children's own motivation can be predicted from the characteristics of their (antecedent) peer groups (Kindermann 1993, 2007). The second approach, Hierarchical Linear Modeling (Ryan 2001), makes it possible to treat groups as nested entities, so that different prediction weights can be estimated

for each group. Although to date, multi-level approaches have only been used with non-overlapping peer groups, cross-classification strategies make it possible to consider multiple group memberships (for a review, see Fielding and Goldstein 2006).

A third analysis strategy, SIENA (Simulation Investigation for Empirical Network Analysis: Snijders et al. 2007), simulates the relations between individuals and their affiliates over time by using successive estimation steps. Like SEM and HLM, SIENA also examines whether groups have influences on their members, over and above member selection, but an advantage is that estimates can be simulated *over many time points*. The main disadvantage is that SIENA requires categorical data; continuous variables need to be recoded into two or more categories, and little is known about how different numbers of categories influence the outcomes of analyses.

4 Classroom ecologies: peer groups, teachers, and parents

Building on strategies for identifying and analyzing peer group effects, studies of classroom social ecologies will add the simultaneous consideration of the roles of teachers and parents. To follow such a framework (see Fig. 1), constructs and measures are needed that capture the provisions and influences students receive from relationships with multiple partners. In our work, we consider the engagement of a student's peer group members as a resource for that student's own engagement. So, once groups are identified in a setting, we capture the developmentally relevant characteristics of peers by averaging levels of engagement across the members of each individual's group (excluding the individual himself or herself). (Note that central tendencies are simplistic representations; for example, indices of within-group diversity may also be useful). These *peer engagement profiles* are assumed to denote the extent to which students' peer groups are (or are not) supportive of the individuals' own academic endeavors.

Teacher involvement. In order to examine teacher effects, constructs are needed that specify what teachers contribute to students' changes. We follow a relationship perspective and focus on *teacher involvement*, which involves students' experiences of their teachers as warm, caring, affectionate, and available as opposed to unavailable, hostile, rejecting, or indifferent (e.g., Skinner and Belmont 1993). Student ratings of teacher involvement are positively correlated with teacher-ratings of students' classroom engagement (correlations were between 0.24 and 0.33 in grades 3 through 7) as well as with academic performance (from 0.21 to 0.33, all $p < 0.01$, Skinner et al. 1998).

Parent involvement. Although parents are usually not present in school, their relationships with children can be expected to carry over into the classroom (Hill and Tyson 2009). In our work, we use a construct that parallels teacher involvement, and so includes children's experiences of their parents as warm, caring, and supportive, as opposed to rejecting and insensitive. Measures of these parental provisions are moderately correlated with students' self-reports of their own academic competence, commitment to school, sense of relatedness, and adaptive coping (Skinner et al. 2005).

5 Empirical illustration: peer effects in the context of teacher and parent relationships

To illustrate the potential richness of research that considers classroom ecologies comprising relationships with peers, teachers, and parents, we draw examples from a study that relied on information about an entire cohort of sixth graders in a small town in the Northeastern US (Kindermann 2007). We first present analysis strategies for studying natural peer influences. Building on these, we then describe analyses that begin to examine whether peer influences differ for students who differ in the quality of their relationships with teachers and parents. We think of this work as exploring "differential susceptibility" to peer influences and it is one of the main foci of our research.

At the present time, these analyses compare peer effects across subgroups of students who differ in the quality of their relationships with teachers and parents. The expectation was that there would be subsets of students who would be relatively immune to peer influences, namely, groups of children who perceived their teachers or parents as very supportive. In contrast, students who have distant relationships with either parents or teachers may be particularly open to influences from peers. The results are tentative and should be considered with some caution.

6 Methods

Of the 366 sixth grade students (ages 11–12; 48% girls) enrolled at the sole middle school in a suburban town, 340 participated with parents' permission. Students were predominately of European American descent and from working to middle class families. Student data were collected on two measurement occasions. The first wave was collected within the first 3 months of the school year, the second within the last 3 months. Teacher reports on students' characteristics were also collected and all teachers completed their assessments within a month around the student assessments. Missing data were estimated using the Full Information Maximum Likelihood (FIML) method.

Student engagement. Students' engaged and disaffected behaviors and emotions were assessed using a 14-item teacher-report scale that is highly reliable ($\alpha=0.90$), stable over time ($r=0.78$, $p<0.001$, Skinner et al. 2009) and moderately correlated with achievement ($r=0.40$ in mathematics, $r=0.58$ in reading; Skinner and Belmont 1993; Skinner et al. 1990). Teachers reported on 318 students in fall (93% of the consenting students). and 322 students in spring. The sample sizes differ because some students left and new students entered the school over time. Across both time points, engagement data were obtained on 300 students.

Teacher involvement. At the beginning of sixth grade, students reported on their teachers' involvement using a measure consisting of eight items tapping student perceptions of teacher availability, caring, warmth, and affection (e.g., "My teacher knows me well"), and eight items tapping unavailability, hostility, and rejection (e.g.,

My teacher does not seem to enjoy having me in class"). It has adequate internal consistency (α between 0.79 and 0.85 in grades 3 through 7) and stability over time ($r=0.55$; Skinner and Belmont 1993).

Parent involvement. Students also reported on perceptions of parents' involvement (Skinner et al. 2005). The 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"). The subscales have high internal consistencies ($α=0.88$ and 0.83), and are negatively intercorrelated ($r=-0.67, p<0.001$) and stable over time (Skinner and Edge 2002). The two constructs of warmth and rejection were averaged, with the rejection items reverse-coded.

Naturally-existing peer groups. Peer groups were assessed using Social Cognitive Mapping (SCM; Cairns and Cairns 1994). Students were asked to list all groups of agemates whom they frequently observed "hanging out" together. Students were instructed to include dyads and to not forget their own groups. At the beginning of the school year, participants provided 3047 group member nominations for 694 groups. To identify *reliable connections*, observations were arranged in a co-occurrence matrix containing the frequencies with which each child was reported to be in the same group as any other child. Binomial z tests examined whether pairs of children were observed together more likely than expected by chance. To account for the many cases with low expected cell frequencies, Fisher's exact test was used in addition, and only connections were accepted that were significant ($p<0.01$) in both tests. Significant connections based on single co-nominations were not accepted, as in almost all cases these were self-nominations.

Peer group characteristics. Once reliable connections were identified, group-level variables were created as *peer group profiles of engagement*. For each student, the engagement scores were averaged of those peers with whom he or she was identified as sharing a group. *Group stability* was calculated as the percentage of peers whom a student kept as group members from Fall to Spring. In addition, the average percentage of *same-sex members* within a group was computed, as well as an additional index of *person-to-group similarity*, namely, the absolute difference between each individuals' own engagement score and the engagement level of his or her group. Finally, students' mathematics grades and *achievement scores* served as an additional control (averaged across the school year).

7 Results indicating influences from students' social networks

An average child had about five members in his or her peer group. Students were connected with groups whose members were motivationally fairly similar to the children themselves ($r=0.44$; consistent with our earlier studies, Kindermann 1993; Kindermann et al. 1996). Children's own engagement was highly stable across the school year ($r=0.80$, as in all studies using this measure of engagement; Skinner et al. 2009). Peer groups were less stable; about 50 % of a child's group members were exchanged
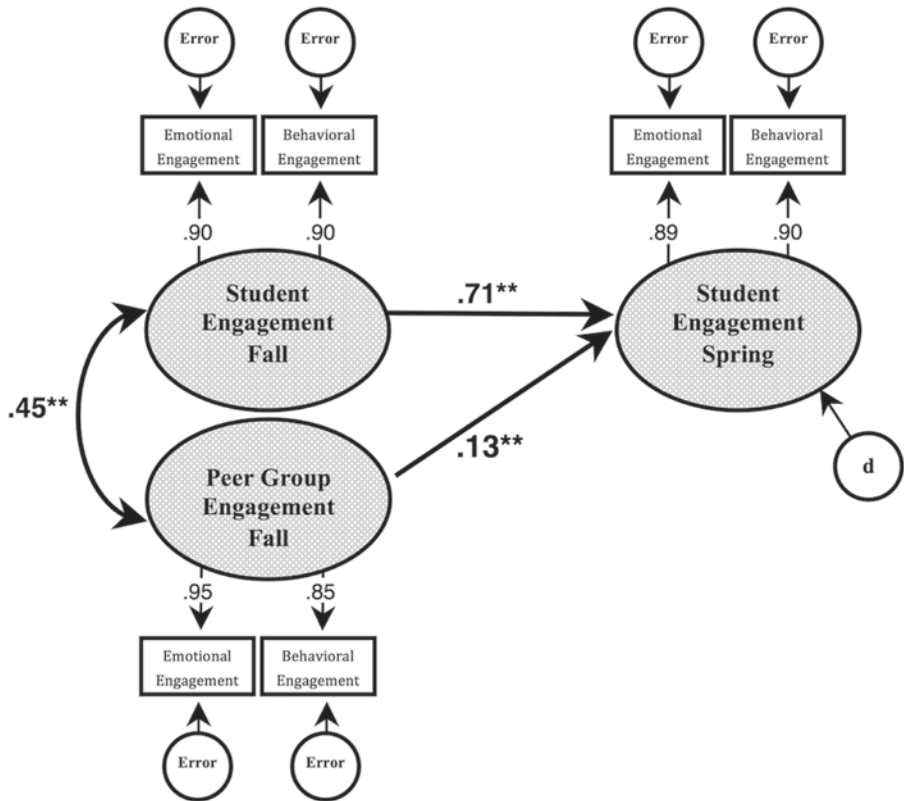
Fig. 2 Peer Group Selection and Peer Influence Processes in a Structural Equation Model. (Note. $\chi^2(23)=22.660$, ns; CMIN/df=0.985, CFI=1.00, RMSEA=0.000 (90 % CI=0.000 to 0.042). The figure is adapted from Kindermann (2007). Correlations between measurement errors as well as the control variables are omitted from this figure.)

over time. However, despite changes in the specific members who made up children's groups, the members were exchanged in a way so that the *motivational composition* of the networks remained relatively similar ($r=0.42$, $p<0.01$).

Just as in our previous studies, there were also indications of motivational influences of children's social networks on changes in their own engagement over time. Figure 2 gives an overview for the 6th graders. The effects were small and explained about 2–4 % of the variance in changes in children's engagement. Nevertheless, individual change was explained by peer group profiles over and above children's high stability in engagement and the effects of similarity to their initial peer groups.

The group influence effect remained significant across the school year even when gender, network size, group stability, and mathematics achievement were controlled. This minimizes suspicions about confounding effects. Thus, it is unlikely that it was just girls (who were more engaged and affiliated with other girls) who changed positively, whereas boys declined (there were no gender differences in rates of change, despite mean level differences). Of course, the nested nature of the group data would make multi-level models preferable. However, the current SEM findings were con-

firmed by SIENA analyses for which concerns about nestedness are not so much of
an issue (these analyses included additionally the peer group profiles at the end of the
school year; they used four engagement categories, defined by differences of half of
a standard deviation; Kindermann et al. 2013).

8 Differential influences in classroom ecologies: peer groups, teachers, and parents

In addition to their social networks among peers at school, students form relation-
ships with teachers, and they bring to the classroom relationships with their parents.
In the following, we present examples of how the interplay among these relationships
can be captured. At the current time, these analyses are preliminary and tentative.
They focus on differential effects, asking whether there were sets of students who
experienced greater or lesser influences from peer groups depending on the quality of
their relationships with adults. In the future, these analyses will need to be comple-
mented with analyses of interaction effects.

Across sixth grade (Kindermann 2007), children's perceptions of their parents'
and teachers' involvement contributed significantly to changes in their own engage-
ment. The magnitude of effects seemed a bit larger than that of peer effects. When
teachers and parents were individually added to analyses of peer effects, the effects
of peer engagement profiles persisted and teacher ($\beta = 0.37$) and parent involvement
($\beta = 0.30$, both $p < 0.001$) each made additional contributions to changes in engage-
ment. When all three relationships were included simultaneously, peer effects also
persisted, but the effects from teachers and parents cancelled each other out. We took
this as indicating that both adult relationships had similar effects. In order to avoid a
(possible) misinterpretation that peers could be more important than adults, teacher
and parent involvement scores were combined into a variable of adult involvement
(their correlation was $r = 0.53$, $p < 0.001$). These aggregated scores contributed sig-
nificantly to students' changes in engagement ($\beta = 0.09$, $p < 0.05$), over and above the
effects of peer groups ($\beta = 0.13$, $p < 0.05$).

In a second step, we explored the possibility of differential susceptibility to peer
influences. Expectations were that peer groups would have relatively small effects
when adults were highly involved in students' lives, but would show especially
powerful socializing influences when students experienced little involvement from
teachers or parents. To examine these effects, multiple group SEM analyses were
used (Kline 2011). Students who fell in roughly the highest third and lowest third of
parental and teacher involvement were separated into high or low teacher involve-
ment groups (both $n = 116$) and high or low parental involvement groups ($n = 126$;
$n = 128$). Differences between these groups in their sensitivity to peer influence were
examined in separate sets of analyses (most of the controls were omitted because
of multicollinearity, but children's gender and group stability were included). These
analyses are preliminary because extreme group comparisons tend to be problematic
(Preacher et al. 2005); refined future analyses will follow up on the expectations with
examinations of interaction effects.
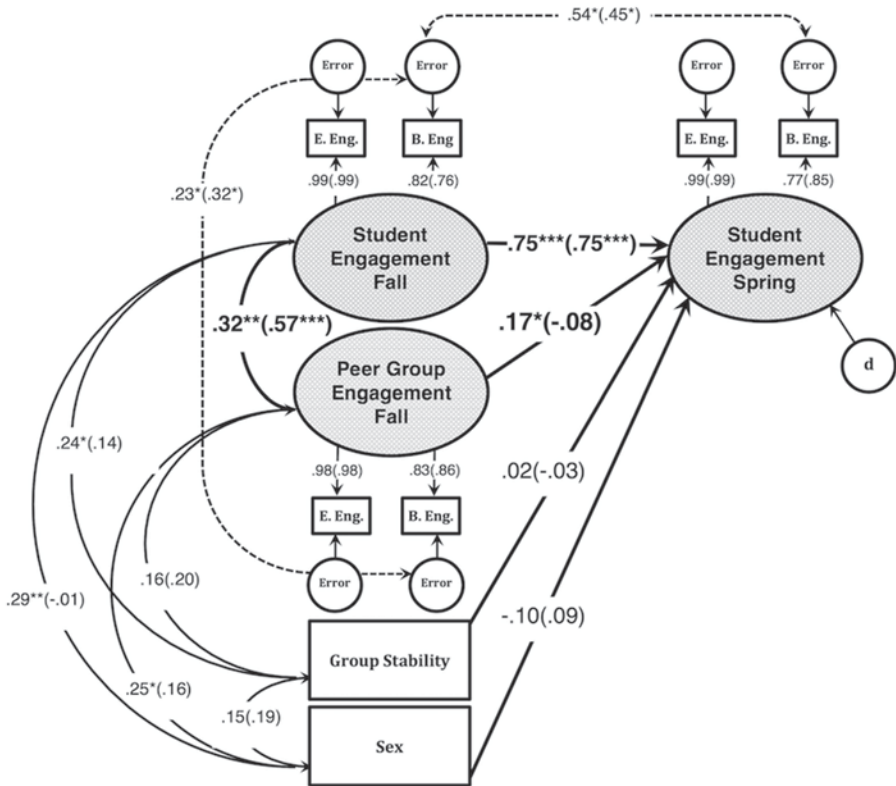
Fig. 3 Differential peer group influences when students experience low (versus high) involvement from their teachers. (Note. $\chi^2(26)=21.910$, ns; CMIN/df=0.843, CFI=1.00, RMSEA=0.000 (90% CI=0.000 to 0.043). Fit indices for additional models used to test for invariance are available from the authors. Standardized coefficients are shown in the model.)

Teacher involvement can make a difference. Results from the multiple group analysis supported our expectations about differences in susceptibility to peer influences. When controlling for sex, peer group stability, prior engagement, and prior person-to-group similarity (selection), the configural model (see Fig. 3) showed that peer engagement in Fall predicted changes in students' engagement from Fall to Spring for those students who experienced low teacher involvement ($\beta=0.17$, $p>0.05$), but not for students whose teachers were highly involved ($\beta=-0.08$, ns).

The significance of the differences between groups was explored in two additional steps. Invariance testing at the measurement-level of the model revealed only *partial* measurement invariance (compared to the configural model; $\Delta\chi^2(2)=2.09$, ns) when cross-group equality constraints were placed on the factor loadings (one item was found to load onto the spring student engagement item differentially across groups, and so was allowed to vary freely across groups). In contrast, cross-group equality constraints placed on the parameter of the model representing peer influence did contribute to significant losses in model fit $(\Delta\chi^2(1)=4.32, p<0.05)$. This supports
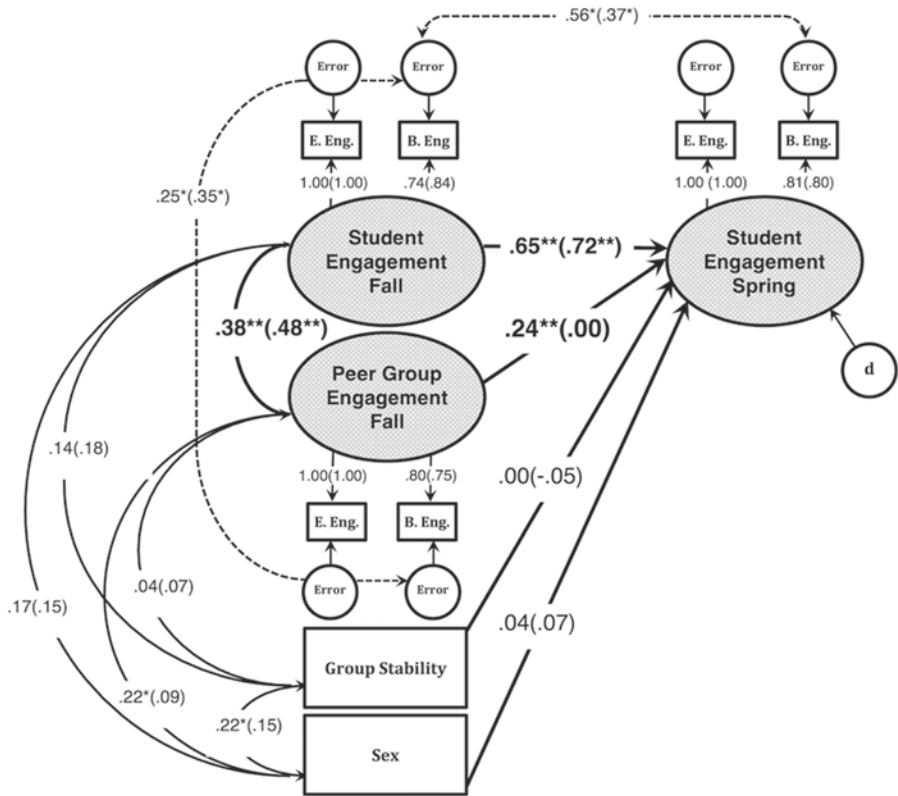
Fig. 4 Differential peer group influences when students experience low (versus high) involvement from their parents. (Note. $\chi^2(63) = 19.627$, ns; CMIN/df = 0.775, CFI = 1.00, RMSEA = 0.000 (90 % CI = 0.000 to 0.032). Fit indices for additional models used to test for invariance are available from the authors. Standardized coefficients are shown in the model.)

the expectation that differences in sensitivity to peer influences can be found between students whose teachers were high versus low in involvement.

Parent involvement can make a difference. The results on parents also supported our expectations. The configural model (see Fig. 4) showed differences between students whose parents provided high versus low levels of involvement. As expected, group engagement in Fall predicted engagement changes over time for students who experienced low parental involvement ($\beta = 0.24$, $p < 0.001$), but not for students with high parental involvement ($\beta = 0.00$, ns).

Again, the significance of the differences was explored in two further steps. Invariance testing at the measurement-level showed no significant reductions in fit (compared to the configural model; $\Delta\chi^2(3) = 0.17$, ns) when cross-group equality constraints were placed on the factor loadings. In contrast, cross-group equality constraints placed on the parameter of the model representing peer influence contributed to significant losses in model fit ($\Delta\chi^2(1) = 4.30$, ns). This indicates that differences existed in students' sensitivity to peer influence. When students perceived their par-

ents as not much involved in their lives, they were more sensitive to peer influences on their academic engagement.

9 Discussion

Max Weber made the insightful observation in 1947 that "… if at the beginning of a shower a number of people on the street put up their umbrellas at the same time, this would not ordinarily be a case of action mutually orientated to that of each other, but rather of all reacting in the same way to the like need of protection from the rain." (p. 114). Gest and Kindermann (2012) used the term *contextual confounds* to describe situations in which overarching influences in a setting influence members of a peer network in the same way.

The current paper was inspired by Weber's scenario: To accurately depict peer group influences in school, researchers will need to pay attention to contextual confounds. If all the students in a classroom open their books at the same time, this could be modeled as an effect of peer influence, but it seems more likely that the teacher instructed everybody to do so. In school-based studies, the most important "context" is the teacher. Much of what can appear as if it were a network effect may instead be organized by the teacher. In Bronfenbrenner's terms (Farmer et al. 2011), one needs to make visible the "invisible hand" of the teacher. And parents, even if usually not present in the classroom, may have similar effects.

From the perspective of *classroom ecologies*, relationships with adults are not just confounds, they are key determinants that create the mesosystem of the classroom. At a minimum, one should make sure that network effects do not disappear when teacher or parent influences are taken into account. More substantively, joint consideration of all three kinds of relationships should provide the most accurate explanation of social influences on academic development (see Wentzel 1998).

9.1 Direct examination of mechanisms of peer group influences

As long as studies are not experimental, cause and effect relationships can only be approximated. Because peer networks cannot be randomly assigned, naturalistic studies are necessary. One strategy that can allow naturalistic studies to inform our understanding of causal influences is to use observational methods that directly target possible mechanisms of effects. One of our studies (Sage and Kindermann 1999) explicitly targeted *peer reinforcement as* a mechanism of social influence. The question was whether the members of a child's peer group (compared to non-members or the teacher) would show differential reinforcement patterns as consequences of that student's on-task and off-task behavior. If (1) experimental studies show that a causal relationship is likely (the tradition of group experiments can be taken as supporting evidence), and (2) correlational evidence leads to suspect that such effects can exist in the real world, then (3) a third step can aim to show that those mechanisms that were experimentally shown to be causal, can also be identified in real world settings. Converging results across the steps supports arguments that a causal relationship may be present.

In a classroom attended by (25) fourth and fifth graders, trained observers coded everyday teacher and student behavior for about 2 weeks, after SCM peer groups were independently identified. Observations were conducted in random sequences of 3-min blocks; coding on- and off-task behaviors and reactions from social partners sequentially in the natural sequence of events (12,043 observations; *kappa* = 0.71). The main question was about the learning *contingencies* for children's on-task and off-task behavior, and whether reinforcement patterns from members and non-members of peer groups would differ (and differ from those of the teacher). Split-half comparisons showed that highly engaged children experienced positive contingencies following their (frequent) on-task behaviors from members of their peer groups as well as from the teacher. In contrast, disaffected students did not experience any on-task support from their groups or other classmates; but only from the teacher. This suggests that for highly engaged students, peer support can have a motivating function, and that peer reinforcement can be one mechanism that could explain the peer influence patterns in our correlational data.

9.2 Implications for Policy

School is probably the single most influential cultural institution in the world (Meece and Schaefer 2010) and influences from school settings seem to be normative for the vast majority of children; estimates are that between 65 % and 75 % of the world's children receive formal education. Experiences in school likely constitute some of children's most formative developmental influences. If school settings are social ecologies, researchers and educators may need to focus their attention on *social relationships* that play a role in the classroom.

Educational and developmental psychologists have become interested in how teachers, parents, and peers *jointly* influence children's development in the same setting. This interest is explicitly guided by Urie Bronfenbrenner's postulate that social interactions are the "engine of development" (Bronfenbrenner and Morris 1998; Eccles and Roeser 2010). Thus, children may need to be seen as people who hold perspectives and have needs of their own, and teachers similarly as people whose relationships with students are not independent of students' own relationships among each other. Kathryn Wentzel (1998) coined the term "pedagogical caring" to describe classrooms in which teachers support students' needs for feeling related to teachers. Students do better in school when teachers care about them, they do better when they care about their teachers, and also when they care about each other.

A focus on relationships as integral parts of the classroom ecology leads to questions of whether *attention to relationships* should be re-introduced into the professional training of teachers, because it would be beneficial for students' development. Efforts at improving teaching are often just seen as a matter of teaching prospective teachers the right academic content and the most effective pedagogical skills. The current paper aims to make the point that teachers would also need to become good observers, who learn about students' social lives, and learn to guide their social and affective adjustment in peer relationships. It may be unwise to relegate such issues to school counselors or to leave them to chance. The view that classrooms are important social ecologies for children provides encouragement to graduate schools of educa-

tion to revisit Gronlund's (1959) suggestion that teachers need to (also) be experts in establishing relationships with students and in guiding children's development of their social relationships. In many ways, this would lead to the goal of making a focus on relationships a priority in the classroom.

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