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Classroom Peer Relationships and Behavioral Engagement in Elementary School: The Role of Social Network Equity

Elise Cappella · Ha Yeon Kim · Jennifer W. Neal · Daisy R. Jackson

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Abstract Applying social capital and systems theories of social processes, we examine the role of the classroom peer context in the behavioral engagement of low-income students ($N = 80$) in urban elementary school classrooms ($N = 22$). Systematic child observations were conducted to assess behavioral engagement among second to fifth graders in the fall and spring of the same school year. Classroom observations, teacher and child questionnaires, and social network data were collected in the fall. Confirming prior research, results from multilevel models indicate that students with more behavioral difficulties or less academic motivation in the fall were less behaviorally engaged in the spring. Extending prior research, classrooms with more equitably distributed and interconnected social ties—social network equity—had more behaviorally engaged students in the spring, especially in classrooms with higher levels of observed organization (i.e., effective management of behavior, time, and attention). Moreover, social network equity attenuated the negative relation between student behavioral difficulties and behavioral engagement, suggesting that students with behavioral difficulties were less disengaged in classrooms with more equitably distributed and interconnected social ties. Findings illuminate the need to consider classroom peer contexts in future research and intervention focused on the behavioral engagement of students in urban elementary schools.

E. Cappella (✉) · H. Y. Kim · D. R. Jackson
Department of Applied Psychology, New York University, 246 Greene Street, New York, NY 10003, USA
e-mail: elise.cappella@nyu.edu

J. W. Neal
Department of Psychology, Michigan State University, East Lansing, MI, USA

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Introduction

Behavioral engagement—including attention, participation, and effort in academic activities—is a strong and consistent predictor of children's educational outcomes (Fredricks et al. 2004; Greenwood et al. 2002). Although numerous studies have identified child characteristics associated with behavioral engagement in school (e.g., child motivation, behavioral difficulties; Pagani et al. 2012; Furrer and Skinner 2003), an ecological approach to the study of schools (Trickett and Rowe 2012) underscores the importance of considering classroom contextual factors as well. Most classroom research on behavioral engagement has focused on teaching practices, such as behavior management and organization (Downer et al. 2007; Skinner et al. 1998). However, new efforts are underway to understand the peer context of classrooms, including the social norms (Henry et al. 2004) and social networks (Ahn et al. 2010) that may be relevant to students' behavioral engagement in schools.

In this study, we apply social capital theory and systems theories of social processes to examine the role of the classroom peer context in the behavioral engagement of low-income students in urban elementary schools. Specifically, we test whether equitable and interconnected classroom social networks predict engagement across one school year. We examine associations between classroom social network structure and engagement within the context of teacher practices and student behavioral difficulties. The overall goal is to better understand the classroom peer

contexts that enable more children to engage in the primary learning activities of elementary school, with an eye toward informing classroom contextual interventions that promote academic outcomes.

Child Correlates of Behavioral Engagement

Academic engagement is broadly defined as the ways in which, and the extent to which, students are committed to or involved in school, and represents daily interactions between students and their learning contexts (Fredricks et al. 2004; Suarez-Orozco et al. 2009). Although academic engagement has multiple dimensions, including cognitive and relational engagement, the most commonly studied is behavioral engagement (Lawson and Lawson 2013). Behavioral engagement is the observable act of students being involved in learning; it refers to students' participation in academic activities and efforts to perform academic tasks (Fredricks et al. 2004; Suarez-Orozco et al. 2009). Research indicates behavioral engagement is directly and strongly associated with academic performance (Archambault et al. 2009; Hughes et al. 2008).

Most research on behavioral engagement and related dimensions has focused on child characteristics. For example, children's attentional and behavioral difficulties negatively predict engagement within and across time (Baker et al. 2008; Downer et al. 2007; Pagani et al. 2012). Gender has also been shown to relate to engagement, with girls in late middle childhood and adolescence more engaged than boys (Furrer and Skinner 2003; Pagani et al. 2012). In addition, academic motivation is consistently and positively associated with multiple forms of engagement (Patrick et al. 2007).

Lastly, and critical to this study, peer relationships contribute to students' engagement. Social capital theory suggests peers provide psychosocial and academic resources that enhance individual students' academic outcomes (Coleman 1988; Dika and Singh 2002). Empirical studies concur, demonstrating positive peer relationships and social network connections (i.e., individual friendship or "hanging out" ties) are associated with academic adjustment (Furrer and Skinner 2003; Wentzel et al. 2010) and achievement (Pribesh and Downey 1999). Guided by extant research on behavioral engagement, these child factors—behavioral difficulties, gender, motivation, and social network connections—are included as covariates in the current study.

Classroom Factors and Behavioral Engagement: A Focus on Social Network Equity

Classrooms are the primary contexts for peer relationships and engagement in elementary school. Recent studies using the classroom or peer group as the unit of analysis suggest the peer context—in particular, peer norms—contribute to student behavioral and academic adjustment (Henry et al. 2004). Classroom norms for aggressive or prosocial behaviors have been shown to influence children's social behaviors and acceptance (Chang 2004; Henry et al. 2000). Likewise, peer group achievement and motivation norms predict changes in students' engagement in middle school (Hamm et al. 2010; Kindermann 2007). As such, it may be expected that classroom norms for prosocial and academic behavior will predict engagement in elementary school as well, but these relations have not been tested.

Although research on peer norms in schools is growing, few studies have focused on the classroom relational *structure*. Specifically, classroom peer relationships can be structured so they are more hierarchical or more egalitarian in the distribution of peer relationships. A hierarchical classroom is one in which only a few children are highly popular or socially connected (i.e., have friendships or "hanging out" ties with many peers in the social network) and many children are not popular or socially connected. An egalitarian classroom is one in which many children are socially connected in friendship or "hanging out" ties to many other children in the classroom.

From Dewey's (1916/1966) concept of a democratic classroom climate (Angell 1991), some scholars argue that classrooms with more egalitarian and interconnected social structures will enhance children's social and academic outcomes (Gest and Rodkin 2011). To date, however, empirical research has focused only on social outcomes. Ahn et al. (2010) found that aggressive children were more popular in classrooms with hierarchically-structured social networks compared to aggressive children in classrooms with more egalitarian networks. Similarly, classrooms with rigid and hierarchical status structures were more likely to have children who remained victims of peer aggression over time (Schäfer et al. 2005).

No studies have examined associations between the classroom relational structure and children's academic outcomes. Systems theories suggest individuals learn through proximal social processes involving relationships, norms, and participation (Tseng and Seidman 2007). Research outside schools suggests these social processes, including social connections and cohesion, relate to child and adolescent adjustment (Duke et al. 2011; Smith et al. 2013; Standard et al. 2010). School research similarly suggests classroom learning occurs through relationships and interactions (Hamre and Pianta 2010), with academic behaviors and achievement heightened when students are connected in positive and productive ways (Johnson et al. 1991; Rohrbeck et al. 2003). Engagement is seen as a social and collective process facilitated through resource access, shared conversations, and behaviors (Parr and

Townsend 2002; Webb and Palincsar 1996). Classrooms in which many children are connected to one another may provide access to peer resources and opportunities for engagement.

In the current study, we use a social network approach—social cognitive mapping—to assess social connections across the classroom (Cairns and Cairns 1994). We test whether *social network equity*—interconnected and distributed classroom social connections—predicts behavioral engagement among individual students over time.

Social Network Equity and Classroom Organization: Effects on Engagement

Opportunities for engagement may be present not only through social connections but also through teacher practices. Skinner et al. (1998) found teachers' provision of structure in the classroom—e.g., organization and management of time, behavior, and attention (Pianta et al. 2008)—was related to changes in student engagement over 3 years. Downer et al. (2007) showed that students in more organized classrooms exhibited more on-task behaviors. Teachers' organization of learning time, facilitation of activities, and management of behavior may create a predictable setting in which engagement is maximized (Emmer and Stough 2001). Despite recent calls to integrate teaching and peer research (Farmer et al. 2011), no studies have examined how teaching practices and peer relationship structures interact to predict engagement. However, scholars have suggested that positive interdependence among students may be most likely to facilitate academic behaviors in classrooms with effective organization (Choi et al. 2011). One goal of the current study is to examine whether the *combination* of classroom organization and social network equity predicts behavioral engagement.

Student Behavior Problems and Social Network Equity

Behavioral engagement is negatively related to behavioral difficulties (e.g., inattention, hyperactivity; Baker et al. 2008; Pagani et al. 2012). However, recent scholarship suggests this association may be moderated by classroom factors (Baker et al. 2008; Downer et al. 2007; Hamre and Pianta 2005). At the child level, (Hodges et al. 1999, 1997) found benefits of friendship and social connections for children with adjustment difficulties. At the classroom level, interventions that build collaboration across classmates have improved students' attention to academic materials, particularly among students with attentional and behavioral problems (DuPaul et al. 1998). The current study tests whether the negative association between behavioral problems and behavioral engagement is lessened in classrooms with equitable and interconnected social ties.

Current Study

The current study has three aims. First, we examine whether the classroom relational structure—*social network equity*—longitudinally predicts behavioral engagement in elementary classrooms beyond individual social connections and other child and classroom covariates. Second, we study whether classroom organization moderates the association between social network equity and behavioral engagement from fall to spring. Lastly, we test whether social network equity moderates the relation between student behavior problems and behavioral engagement from fall to spring. We examine these questions with multilevel analyses in a sample of low-income students from urban public elementary schools. The goal is to focus attention on the classroom structure of peer relationships as a means toward increased understanding of the social environments that enhance behavioral engagement for children in low-income schools.

Method

Setting

Data were collected at five public elementary schools in a large urban district participating in a classroom-randomized intervention trial. The trial examined effects of a teacher consultation and coaching program delivered by school and community mental health professionals on change in observed classroom interactions and the functioning of children with and without behavioral difficulties across one school year (see Cappella et al. 2012). Schools were selected based on proximity to a collaborating agency and economic disadvantage (free/reduced lunch eligibility: 89–99 %). According to public school records, schools enrolled mainly Latino (87 %) and Black (11 %) students; average school size was 761 students.

Participants

Current study participants ($N = 80$) were drawn from the full sample of consenting second to fifth grade students ($N = 218$) in 22 classrooms (class size $M = 22.55$; $SD = 5.84$) participating in the larger trial. Teachers were recruited through letters of invitation followed by meetings with research staff. Children were recruited through classroom presentations and letters home in English and Spanish to parents. Informed consent was obtained from parents and teachers; written assent was collected from children (for details about recruitment procedures, see Cappella et al. 2012).

The current study sample, a subset of the full sample with parental consent, was selected for more intensive data

collection, including the dependent measure in this study. Given the goals of the larger trial to improve functioning of children with and without behavioral difficulties, teachers were asked to choose two consented students from their classrooms with behavioral difficulties, such as inattentive, hyperactive, or aggressive behavior. Among the remaining consented children, two additional students per classroom were randomly selected for the current study sample (~four children per classroom).[1] Slightly more boys than girls (41 % female) participated. Children's mean age was 9.23 years (SD = 1.20). Teachers reported children's race/ethnicity as Latino (86 %), Black (9 %), and mixed/other (3 %); all children were eligible for free/reduced lunch. Teachers were mostly female (77 %), and identified as White (45 %), Latino (35 %), Black (15 %), or other (5 %).

Procedures and Measures

All study procedures and measures were approved by the university and school district institutional review boards. Observation data were gathered in the fall (classroom and child) and spring (child); observation procedures are described below. Questionnaires were gathered from teachers and children in the fall. Teachers completed current study measures as part of a larger assessment protocol. Following district guidelines, schools received small monetary gifts for teachers' time in research. Children completed surveys in classrooms or small groups. Two to four researchers were present to read items aloud and answer questions. All children in participating classrooms received prizes (pencils, erasers) valued at less than $1.

Behavioral Engagement

The Behavioral Observation of Students in Schools (BOSS; Shapiro 2004; DuPaul et al. 2006) was used to create indices of student ***behavioral engagement*** (fall and spring) and ***classmate engagement*** (spring). Momentary time sampling was used to code the presence of active (e.g., writing, reading aloud) or passive engagement (e.g., listening to teacher, looking at worksheet) during academic activities. Each student ($N = 80$) was observed on two separate occasions. Observations took place during morning hours of literacy or math instruction. Each observation consisted of 60 15-s intervals. Each participating student's engagement was coded in four consecutive intervals; randomly selected classmates' engagement was coded every fifth interval. Therefore, in each observation the participating student was observed for 48 intervals (96 intervals across two observations) and randomly selected classmates (up to 12 classmates per observation) were observed for 12 intervals (24 intervals across two observations).

For both the student and classmates, the total behavioral engagement percentage was calculated by dividing the total sum of active and passive engagement codes by the total number of intervals observed and multiplying by 100. These percentages were then averaged over the two mornings of observation. Because active and passive engagement codes were mutually exclusive, the averaged percentage scores were summed for an overall percentage of behavioral engagement.

Single blinded data collectors conducted observations. Observers were trained through: (a) participation in a 4-h workshop, (b) completion of 10 video tapes of practice coding, (c) completion of live practice observation, and (d) passing a reliability test in two live observations with a master coder. The reliability test required observers to achieve >.80 agreement with a master coder on active and passive engagement in classrooms with a similar ethnic and socio-economic composition as participating classrooms. Continuing reliability was assessed with master-coded video from a classroom in the same school district. Initial training reliability averaged .95 agreement (range .88–.98); continuing reliability averaged .90 agreement (range .85–.97).

Behavioral Difficulties

Students' ($N = 80$) behavioral problems were measured in the fall using the Total Difficulties score from the Strengths and Difficulties Questionnaire–Teacher Report (SDQ; Goodman 2001). The SDQ is a 25-item measure focused on children's classroom behavior, and is a good fit across gender and ethnicity among school age samples (Hill and Hughes 2007). The Total Difficulties score involves four subscales (hyperactivity-inattention, conduct problems, emotional symptoms, and peer relationship problems) with five items in each. Items are coded 0 (not true), 1 (somewhat true), or 2 (certainly true), and summed within subscales. A sum of the four subscales provides a Total Difficulties score (current study $\alpha = .90$).

Academic Motivation

The Academic Motivation Inventory (AMI; Ginsburg-Block and Fantuzzo 1998) was used to assess children's ($N = 80$) self-reported academic motivation in the fall. Adapted from the YCAIMI (Gottfried 1990) for children in urban low-income elementary schools, the AMI measures enjoyment of and curiosity about learning, orientation toward mastery, and persistence in the face of challenges (Gottfried 1990). The AMI consists of 13 items rated on a

[1] Six classrooms had fewer than four child participants because of student absences or incomplete teacher surveys.

scale from 0 (not true) to 2 (true) and summed for a total motivation score (current study $\alpha = .74$).

Social Networks

Social cognitive mapping data (Cairns and Cairns 1994; Gest et al. 2003) were collected in the fall to create the ***degree centrality*** scores (child level covariate) and ***social network equity*** scores (classroom level predictor). Social cognitive mapping is an established peer-report procedure that provides information on all classmates from a subset of participants, ensuring complete representations of classroom peer networks (Cairns et al. 1995).

Social network data were collected from the full sample of consented 2nd–5th grade children in the larger study ($N = 218$). Consented children were asked to list as many groups and members as they knew who "hang out" together in the classroom. Children could list any classmate, consented or non-consented, as a member of a group; children were not required to list all classmates. Cairns and Cairns (1994) advocated the use of social cognitive mapping as a robust approach to collecting classroom network data when consent rates were 50 % or lower. Peer-reported network measures correspond with other indicators of peer networks including self-reported relationships (Cairns et al. 1995; Neal 2008) and behavioral observations (Gest et al. 2003).

Data from respondents in each classroom were combined using consensus aggregation in UCINET 6 (Borgatti et al. 2002) to create a classmate-by-classmate matrix. Each cell in the matrix indicated the number of respondents who identified a connection between a pair of classmates (Krackhardt 1987). Then, a binomial test was used to dichotomize the aggregated matrix into the presence or absence of a connection between each dyad of children. This test determined how many respondents needed to report a connection between a pair of classmates to exceed random chance ($p = .05$) given the number of respondents in the classroom and the underlying probability of success (i.e., the total number of connections reported in a classroom across all respondents divided by the total possible number of connections that could be reported) (see Neal 2008).

For each child, network degree centrality was calculated in UCINET 6 from the aggregate networks. Freeman's (1978/1979) measure of normed degree centrality provides the number of social connections an individual child has, divided by the total number of possible social connections in the classroom (Borgatti et al. 2002). The means and standard deviations of degree centrality of all classmates were used to calculate the social network equity of each classroom:

$$Social\,Network\,Equity = -\left(\frac{Degree\,Centrality\,SD}{Degree\,Centrality\,M}\right)$$

This equation produces a coefficient of variation that provides a normalized measure of the dispersion of degree centrality in each classroom (Hendricks and Robey 1936). Taking the inverse (i.e., multiplying by -1) allows the higher value to indicate greater social network equity. This facilitates interpretation of scores, as high scores then signify more social network equity.

Positive Behavior Norms

Positive behavior norms in each classroom were assessed in the fall through an adapted version of the prosocial scale of the Child Social Behavior Scale–Peer Report (Crick and Grotpeter 1995) and the peer nomination survey (Lease et al. 2002). Following original procedures, all consented 2nd–5th graders in the larger study ($N = 218$) were provided class lists that included the names of all classmates. Children were asked to circle the names of as many or as few classmates as fit descriptors of two prosocial behaviors (cheers up others, does nice things) and two academic behaviors (does good work, participates). For each child and each descriptor, the value of the total nominations received was divided by the value of the total possible nominations, yielding child proportion scores for each descriptor (Coie and Dodge 1983). Because participating children reported on all classmates, this procedure creates proportion scores for every child. The four descriptors were averaged for a child positive behavior score (current study $\alpha = .89$). Aligned with prior work, individual scores were aggregated into classroom mean scores to represent the classroom positive behavior norm (Cappella and Neal 2012).

Classroom Organization

The Classroom Assessment Scoring System (CLASS; Pianta et al. 2008) measured fall classroom organization. Classroom organization comprises three dimensions of teacher practices: behavior management (proactive and positive strategies), productivity (management and maximization of learning time), and instructional learning formats (engaging facilitation of activities). Each dimension contains a detailed description, behaviorally-anchored scale points, and behavioral indicators (see Mashburn et al. 2008). Each dimension was coded four times per teacher on a seven-point scale ranging from 1 or 2 (low) to 6 or 7 (high). These four scores for each dimension were then averaged into dimension scores. The arithmetic mean of the three average dimension scores yielded a classroom organization domain score (current study $\alpha = .90$). High

scores in this domain predict children's adjustment in diverse classroom settings (Downer et al. 2012; Ponitz et al. 2009).

CLASS observers were trained following standard procedures (Pianta et al. 2008): (a) a two-day workshop with a certified trainer, (b) scoring within one point of "gold-standard" codes (by CLASS developers) on 80 % of dimensions across four video segments, (c) completion of a live observation with a master coder. Continuing reliability tests were conducted with master-coded video segments. For all observers, initial and continuing reliability codings yielded training inter-rater reliabilities of .96 for the classroom organization domain (range .95–1.00 across dimensions).

Each classroom was observed by a single blinded data collector during morning literacy or math instruction. During the observation, data collectors observed for 15 min and coded for 10 min. The 15 min observation and 10 min coding occurred four times during the observation for a total of 100 min of observations and coding in each classroom.

Results

Below, we describe preliminary analyses and then present results from four hierarchical linear models. The first two models examine between-classroom variability in behavioral engagement in the spring (Model 1) and the predictive relation between child variables and engagement in the spring (Model 2). The third and fourth models test the main research questions: whether social network equity in the fall predicts behavioral engagement in the spring (Model 3), and whether this relation is moderated by fall classroom organization or varies depending upon behavioral difficulties (Model 4).

Preliminary Analysis

Prior to testing hypotheses, we examined the data to check for potential bias in classroom variability in proportion of respondents on the network and classroom norm measure. Fisher Chi square analyses and t tests found no significant difference between classrooms with near 50 % and classrooms with over 50 % primary participation on any network and classroom norm variables.

Missing data in the study sample were also identified and examined. Among the initial sample ($N = 91$), child-level variables had 2–10 % missing information. No information was missing for the classroom-level variables. To maintain consistency across models, only children with complete data were included in hypothesis testing (final sample: child $N = 80$; classroom $N = 22$). T tests confirmed no significant differences in any child-level variable between children included and excluded. Analyses with the initial sample yielded identical results to analyses with the final sample.

Table 1 presents the means, SDs, and correlation coefficients for all variables. On average, students were behaviorally engaged for 69.86 ($SD = 16.92$) percent of the time in the spring. Students were engaged for a similar percentage of time in the fall, but fall engagement was not related to spring engagement. Spring behavioral engagement was positively associated with spring classmate engagement, $r = .43$, $p < .001$. Fall student behavioral difficulties ($M = 16.56$, $SD = 6.24$) were negatively correlated with spring engagement, $r = -22$, $p < .05$. Fall academic motivation ($M = 19.42$, $SD = 4.89$) was positively associated with spring engagement, $r = .28$, $p < .01$. Finally, children were, on average, connected to one in five of their classmates (network centrality $M = 19.40$; $SD = 10.48$).

At the classroom level, social network equity scores averaged $-.59$ ($SD = .18$), and ranged from $-.91$ to $-.34$ (see Table 1), with values closer to 0 suggesting more equitable classroom relational structures. Classrooms fell in the middle to mid-high range for observed classroom organization ($M = 4.40$, $SD = .94$). On average, children reported that positive behaviors characterized about two-fifths of their fellow classmates across the room (positive behavior norm $M = .37$, $SD = .12$). Social network equity and observed classroom organization were positively correlated ($r = .44$, $p < .05$).

Hierarchical Linear Models

Given the nesting in our data (children in classrooms), we conducted preliminary inspection and hypothesis testing with hierarchical linear models (HLM; Raudenbush and Bryk 2002). In all models, spring behavioral engagement served as the dependent variable. Continuous variables at the child level were group-mean centered; continuous variables at the classroom level were grand-mean centered; categorical variables remained uncentered. Robust standard errors were not applied because the data did not meet the required number of Level 2 units.

Unconditional Model

First, we ran an unconditional model with no child or classroom predictors to determine the amount of variance between and within classrooms in spring behavioral engagement (see Model 1 in Table 2). The intraclass correlation coefficient (ICC) of .31 indicated sufficient variability between classrooms to examine classroom-level predictors of the outcome.

Table 1 Primary child-level (N = 80) and classroom-level (N = 22) variable means, standard deviations, and correlation coefficients

Child variables	Mean	*SD*	Min	Max	1.	2.	3.	4.	5.	6.	7.
1. Spring behavioral engagement	69.86	16.92	21.88	100.00	–						
2. Fall behavioral engagement	62.45	13.93	26.04	94.79	.01	–					
3. Spring classmate engagement	71.46	12.48	41.67	95.83	.43***	.18	–				
4. Network centrality	19.40	10.48	.00	56.25	.05	.02	−.01	–			
5. Behavioral difficulties	16.56	6.24	6.00	32.00	−.22*	−.21†	−.10	−.01	–		
6. Academic motivation	19.42	4.89	.00	26.00	.28**	−.17	−.04	.04	−.12	–	
	N		%								
7. Female	33		41		−.03	.05	.12	.17	−.26*	.04	–

Classroom variables	Mean	*SD*	Min	Max	8.	9.	10.	11.	12.
8. Social network equity	−.59	.18	−.91	−.34	–				
9. Classroom organization	4.40	.94	2.42	5.67	.44**	–			
10. Positive behavior norm	.37	.12	.16	.60	.34	.10	–		
11. Grade	4.09	1.06	2.00	5.00	.38	.18	.38	–	
	N		%						
12. Intervention	11		50		−.24	−.09	.32	−.08	–

† $p < .10$
* $p < .05$
** $p < .01$
*** $p < .001$

Child-Level Model

The next step was to include child-level variables as fixed effects: fall student behavioral engagement, spring classmate engagement, network centrality, behavioral difficulties, academic motivation, and gender (see Model 2 in Table 2).

This model explained 27 % of the variance within the classroom. Student behavioral difficulties in the fall negatively predicted behavioral engagement in the spring controlling for child-level covariates ($\gamma_{40} = -.86$, $p = .01$). This indicates students with behavioral difficulties spent less time engaged in academic tasks compared to classmates. Academic motivation positively predicted behavioral engagement beyond covariates ($\gamma_{50} = .72$, $p < .05$). Thus, students with high levels of motivation in the fall spent more time engaged in instructional activities in the spring compared to students with lower levels of motivation. Neither gender nor network centrality significantly predicted engagement.

Classroom-Level Model

The third step was to include fixed effects for classroom-level variables measured in the fall: social network equity, classroom organization, positive behavior norms, grade, and intervention (see Model 3 in Table 2).

Results indicated that 47 % of the between-classroom variance was explained by the addition of these variables. Social network equity positively predicted behavioral engagement ($\gamma_{01} = 35.19$, $p < .05$). As expected, children in classrooms with more interconnected and equitable peer relationships were more likely to be engaged in the spring. Neither classroom organization nor positive classroom norms predicted behavioral engagement.

Moderation Model: Child and Classroom Levels

The final step was to determine whether the relation between social network equity and behavioral engagement varied by classroom organization, and to examine whether social network equity moderated the relation between behavioral difficulties and engagement. Therefore, a classroom-level interaction term (social network equity X classroom organization) was added and social network equity and other classroom-level covariates were fitted on the behavioral difficulties slope.

This analysis explained 67 % of between-classroom variance and 38 % of within-classroom variance in spring engagement (see Model 4 of Table 2). Social network equity continued to predict behavioral engagement ($\gamma_{01} = 57.15$, $p < .001$). No main effect for classroom organization was found. However, classroom organization had a moderating effect on the relation between social

Table 2 Hierarchical linear models predicting behavioral engagement in the spring

Fixed Effect[1]	Model 1		Model 2		Model 3		Model 4	
	γ	SE	γ	SE	γ	SE	γ	SE
Average spring behavioral engagement (Intercept) (γ_{00})	69.35***	2.57	71.29***	2.86	68.70***	3.37	65.22***	3.18
Child level								
Fall behavioral engagement (γ_{10})			.01	.15	.01	.15	.00	.15
Spring classmate engagement (γ_{20})			.21	.14	.19	.14	.18	.14
Network centrality (γ_{30})			.04	.16	.03	.16	.00	.15
Behavioral difficulties (γ_{40})			−.86**	.32	−.86**	.34	−.88	.47
Academic motivation (γ_{50})			.72*	.34	.70*	.34	.83*	.31
Female (γ_{60})			−4.93	3.16	−5.38	3.15	−3.23	2.99
Classroom level								
Social network equity (γ_{01})					35.19*	14.91	57.15***	14.64
Classroom organization (γ_{02})					3.60	2.42	3.68	2.12
Social network equity × classroom organization (γ_{03})							42.63**	14.83
Positive behavior norm (γ_{04})					−12.11	21.63	−45.84	22.09
Grade (γ_{05})					−2.97	2.12	−3.35	1.86
Intervention (γ_{06})					4.77	4.48	9.39	4.45
Behavioral difficulties slope (β_3)								
Social network equity (γ_{31})							6.37*	2.44
Classroom organization (γ_{32})							−.03	.34
Social network equity × classroom organization (γ_{33})							4.45	2.70
Positive behavior norm (γ_{34})							−4.94	3.39
Grade (γ_{35})							−.09	.34
Intervention (γ_{36})							−.21	.79
Random Effect[2]	Variance	χ^2	Variance	χ^2	Variance	χ^2	Variance	χ^2
Classroom level residual, u_0	88.62***	57.97	100.49***	78.92	47.06***	48.13	28.95***	39.73
Behavioral difficulties slope residual, u_1			.31	22.11	.28	21.71	.01	11.14
Child level residual r	194.79		139.82		141.84		121.70	

[1] The standard errors were not Huber-corrected (robust standard error) because the data do not meet the required number of level-2 units to be appropriate for the calculation

[2] The Chi square statistics for random effects are based on 21 of 22 units that had sufficient data for computation

* $p < .05$

** $p < .01$

*** $p < .001$

network equity and engagement ($\gamma_{03} = 42.63$, $p = .01$). Thus, the positive predictive association between equitable peer relationships and engagement was stronger in more organized compared to less organized classrooms (e.g., management of behavior, time, and attention; see Fig. 1a).

Social network equity also had a moderating effect on the association between students' behavioral difficulties and their behavioral engagement in the spring ($\gamma_{31} = 6.37$, $p < .05$), suggesting that the role of equitable peer relationships in the classroom was stronger for children with higher levels of behavioral difficulties (see Fig. 1b). Inclusion of the classroom-level and cross-level interactions resulted in an additional 21 % reduction in between-classroom variance and 10 % reduction in within-classroom variance in behavioral engagement (Model 3 vs. Model 4 in Table 2).

Discussion

We examine the role of the classroom social context in the behavioral engagement of low-income second to fifth grade children across one school year. Confirming prior research, children with more behavioral difficulties or less academic motivation in the fall were less behaviorally engaged in the spring. As suggested by theory and research on social

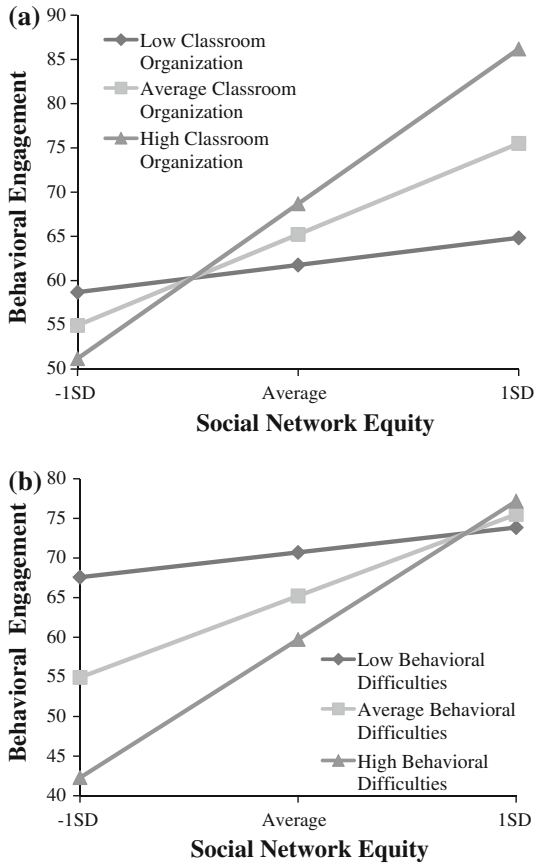

Fig. 1 **a**. Predicted association between social network equity and spring behavioral engagement at low (Mean − 1SD), average (Mean), and high (Mean + 1SD) levels of classroom organization. The predicted spring behavioral engagement values were estimated after adjusting for the child and classroom level covariates included in Model 4. **b**. Predicted association between social network equity and spring behavioral engagement at low (Mean − 1SD), average (Mean), and high (Mean + 1SD) levels of behavioral difficulties. The predicted spring behavioral engagement values were estimated after adjusting for the child and classroom level covariates included in Model 4

processes, classrooms with more equitably distributed and interconnected social ties—social network equity—had more behaviorally engaged students in the spring, especially in classrooms with higher levels of observed classroom organization. Moreover, social network equity attenuated the negative effect of student behavioral difficulties on behavioral engagement. These findings illuminate the need for future research on how to build classroom communities that provide equitable access to peer resources and more opportunities for behavioral engagement across the diversity of students in urban schools.

Child Characteristics and Behavioral Engagement

Consistent with prior studies, students who reported higher levels of academic motivation in the fall, or for whom teachers reported fewer behavioral difficulties, spent more time engaged in the spring. Interestingly, the effect of behavioral difficulties was no longer significant when we accounted for the interaction of classroom characteristics. Scholars argue that behaviors, including inattention, hyperactivity, and aggression, are a result of the dynamic interplay between the child and his/her environment. Results suggest that the link between these behaviors and engagement may depend upon the structures and interactions across the classroom as a whole.

Although not the focus of the current study, fall and spring engagement were unrelated, and no gender differences or child network centrality associations were found. These unanticipated results may relate to the use of direct observations of student behaviors (see Pettigrew et al. 2013) and social network measures (Gest et al. 2003) rather than the more standard self- or teacher-reports (Suarez-Orozco et al. 2009; Wentzel et al. 2010). Also, given the demographic composition of the current study—elementary age, low-income, Latino—magnitudes of associations between child characteristics and engagement may vary from prior studies (Barber and Olsen 2004). More research is needed to explain differences between studies in these child predictors of engagement.

Classroom Characteristics and Behavioral Engagement: Focus on Social Network Equity

Drawing from social capital theory and systems theories of social processes, we considered whether the classroom social structure predicted engagement. Controlling for child and classroom characteristics, children in classrooms with more equitable and interconnected peer relationships in the fall were more likely to be engaged in academic activities in the spring. This finding contributes to a new area of scholarship examining classroom social structures and child adjustment. Early work indicates that aggression may be socially reinforced (Ahn et al. 2010) and peer victimization status may be difficult to change (Schäfer et al. 2005) in classrooms with less equitable social structures.

Although the current study does not explain the mechanism underlying the link between social network equity and engagement, ideas stemming from social capital theory and social process research within and beyond classrooms may be relevant (Dika and Singh 2002; Tseng and Seidman 2007). When students are included in the classroom community and have access to peers for academic or social support, the classroom academic activities may be more available to them (Wentzel and Wigfield 1998). Perhaps interconnected and inclusive settings create a safe space in which to engage in the primary activities of the setting (e.g., Duke et al. 2011; Smith et al. 2013). School intervention research provides support for this notion. Interventions that foster integrated or cooperative communities

enhance student engagement (Rohrbeck et al. 2003; Solomon et al. 2000). The current study contributes to evidence that part of improving engagement may be an equitable social structure in the target setting—in this case, the classroom.

Although not the primary focus in this study, neither positive behavior norms nor classroom organization uniquely predicted spring behavioral engagement. Prior studies of classroom norms demonstrate stronger findings for negative norms, such as aggression, than positive norms (Chang 2004; Stormshak et al. 1999). In addition, the relation between academic norms and engagement (Kindermann 2007) or adjustment (Hamm et al. 2010) has been more consistently demonstrated in middle school. Also, research identifying associations between classroom organization and behavioral engagement (Downer et al. 2007) or achievement (Ponitz et al. 2009) has not considered classroom peer relationships in these associations. Future work is needed with a broader range of behavior norms as well as both classroom organization and social network equity to understand behavioral engagement in classroom contexts.

Interactive Effects of Social Network Equity

The current study responds to calls to examine interactions between teaching practices and peer relationships (Farmer et al. 2011). We found the positive relation between social network equity and behavioral engagement to be stronger in better organized classrooms. This is aligned with education scholarship suggesting that a combination of teaching practices and connectedness among students facilitates classroom goals (Choi et al. 2011). Although the mechanism is unclear, students may serve as more productive and positive resources for one another in more organized classrooms. This finding points toward the need for a multi-pronged approach to classroom intervention, with both classroom organization and peer relational structures as targets.

Lastly, the positive predictive relation between social network equity and behavioral engagement was stronger for children with behavioral difficulties. Although students with behavior difficulties, such as inattention, impulsivity, and hyperactivity, display less engagement overall (Downer et al. 2007), the current study suggests that widespread and equitable access to peers may be protective. This is consistent with past work demonstrating the positive effects of child or classwide social or academic connections on the adjustment of children with behavioral difficulties (Hodges et al. 1999; DuPaul et al. 1998). Given that behavioral engagement is linked to achievement and children with behavioral difficulties are likely to be disengaged, it is important that educators consider social contextual factors as well as other aspects of classrooms (e.g., composition, instructional method) that make a difference for students facing behavioral risk.

Limitations and Future Directions

Findings must be interpreted in light of limitations. First, the sample is small and underpowered. Thus, our model estimates are conservatively biased toward null findings. Although we find significant effects aligned with the theoretical and empirical literature, research with larger samples is needed. Second, our population is homogeneous (low-income, Latino) and weighted toward children with behavioral difficulties. Peer resources may matter more for students with less access to academic enrichment, students from cultures that endorse communal values, and students with behavioral risk (Phelan et al. 1991; Suarez-Orozco et al. 2009). Replication is needed with more heterogeneous samples to increase generalizability of findings. Third, we did not have multiple observers or triangulate across reporters, leading to less confidence in the reliability of the direct observations. Future studies with multiple observers and additional measures of social network equity and engagement would strengthen results. Fourth, we used a short-term longitudinal design in a randomized intervention trial. Intervention was unrelated to study variables and included as a control in all analyses but the design precluded examination of growth across time or mechanisms underlying relations between equity and engagement. Lastly, we cannot ascertain why some classrooms had more equitable and interconnected social structures. Knowing how these structures came to be, including analysis of specific teaching strategies (Gest and Rodkin 2011) and classroom composition (Hattie 2002) would inform classroom intervention.

Conclusion

Research on the peer social structures that facilitate behavioral engagement in urban schools has just begun. From the perspective of social capital theory and systems theories of social processes, focusing attention on peer resources and structures within classrooms builds a deeper understanding of classroom processes that predict engagement. These processes include not only what individual children and teachers bring to classrooms, but also the structure of social relationships across the classroom. This work extends prior research on child behaviors, peer relationships, and teaching practices to suggest that equitable and interconnected social structures play a role in children's engagement in classroom academic activities. These predictive relations are magnified for children with

behavioral difficulties and classrooms with higher levels of organization. Considering social network equity may be critical in future research on classroom social processes as well as in classroom intervention to create contexts conducive to behavioral engagement across the diversity of children in low-income urban schools.

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