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EXAMINING THE EFFECTS OF SCHOOL CONNECTEDNESS ON SOCIAL EMOTIONAL LEARNING TECHNIQUE USE IN MIDDLE CHILDHOOD

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ABSTRACT

Social emotional learning (SEL) interventions are effective in supporting academic and interpersonal outcomes for children in elementary school by teaching children skills to promote self-regulation and attention (Durlak et al., 2011; Elias et al., 1997). Such interventions are being increasingly implemented in schools due to their potential benefits. However, less is known about the student factors that contribute to children's daily application of SEL techniques in situ. Such factors may include students' school connectedness and engagement in the peer network. The current study aimed to investigate whether feelings of connectedness, popularity (indegree) or network social engagement (outdegree), are related to individual's engagement in an SEL intervention in second through fifth graders at a rural elementary school. We found that worse school connectedness was related to greater mean technique usage for second graders, but not third, fourth, and fifth graders. In contrast to connectedness, youth with higher indegree (i.e., more popular) reported using SEL strategies on a greater proportion of school days. This has potential implications for future intervention implementation and engagement strategies.

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Introduction

Examining the Effects of School Connectedness on SEL Technique Use in Middle Childhood

Social emotional learning (SEL) interventions are effective in supporting academic and interpersonal outcomes for children in elementary school by teaching children skills to promote self-regulation and attention (Durlak et al., 2011; Elias et al., 1997). Implementing these interventions in the school setting can reach youth who typically lack access to behavioral and mental health services (Human & Wasem, 1991; Ziller et al., 2010). However, their effectiveness on student academic and interpersonal outcomes likely varies by the extent to which students actually use the techniques that are taught as part of the intervention. Interindividual variation in technique use can be due to a number of characteristics of the school, teachers and classrooms (Durlak et al., 2011). However, less is known about the student factors that contribute to children's daily application of SEL techniques in situ. Such factors may include students' school connectedness and engagement in the peer network.

SEL Interventions

Social emotional learning (SEL) encompasses a number of skills including social awareness, problem solving and self-regulation (Elbertson et al., 2010). According to the Collaborative for Academic, Social, and Emotional Learning (CASEL), there are four core domains of SEL: (1) life skills and social competencies, (2) health promotion and problem-prevention skills, (3) coping skills and social support for transitions and crises, and (4) positive, contributory service (Elias et al., 1997). The goal of SEL is to instill

youth with the personal and social competencies for a positive developmental trajectory (Durlak et al., 2011).

Evidence based universal SEL programs have shown promising effects for school age children (Durlak et al., 2011). Universal interventions are given to a large group of people with little discernment (Offord, 2000). This is advantageous because it avoids potential stigmatization. It also presents the opportunity to address school or community contextual factors. These are distinct from targeted interventions which are given to individuals identified as needing intervention or being 'high risk'. Many SEL programs are created with universal reach in mind (Zins & Elias, 2007).

The benefits of universal proficiency in SEL skills are twofold. First, social-emotional mastery is conducive to positive social interactions and well-being. Compared to students in a control group, students in an SEL intervention had better outcomes on positive social behaviors and attitudes (Durlak et al., 2011; Mahoney et al., 2018). They also fared better with respect to emotional distress and conduct issues. Second, SEL proficiency is related to better academic achievement. Children with better social resources fare better on common metrics of academic achievement such as grades and test scores (Masten & Coatsworth, 1998). SEL skills including emotional regulation, improvement in interacting with adult educators, and cognitive flexibility can all be conducive to better learning outcomes (McClelland et al., 2017). Given its benefits for students and growing popularity in schools (Durlak et al., 2011), more research on its uptake among students is needed to better understand its effectiveness.

Good quality SEL program implementation is critical for optimal intervention outcomes (Jones et al., 2018). Implementation refers to how the designed intervention

program is being followed in the field (Dane & Schneider, 1998). There are numerous factors that can impact implementation of interventions including macro level factors such as organizational elements and school characteristics (Durlak, 2016). Characteristics of school personnel carrying out the program can also impact its implementation fidelity. Staff's confidence that they can implement the program effectively is one such factor. Staff difficulty making classroom time for the intervention or lack of confidence in the program may compromise proper implementation (Dane & Schneider, 1998). Less research exists on the effects of student characteristics on their own participation in the intervention as designed. Even in the context of a well implemented program, students' confidence in the program and other student characteristics, such as their connectedness to the school and peers likely affect how closely they participate in interventions that are offered to them.

School Connectedness

Individual characteristics such as students' feelings of school connectedness may have implications for their engagement in SEL interventions that are universally offered in their school. This is important because promoting school connectedness in all students could lead to students making better use of the programs available to them. Feelings of school connectedness are shown to be conducive to student wellbeing (Allen et al., 2018; Frydenberg et al., 2009).

The Centers for Disease Control and Prevention define school connectedness as "the belief by students that adults in the school care about their learning as well as about them as individuals" (CDC, 2009). Feelings of school connectedness are important for positive outcomes in youth (McNeely et al.; Resnick, 1997; "Wingspread Declaration on

School Connections," 2004). In this study, we operationalize school connectedness as feelings of closeness to people at school and happiness to be at school, obtained by youth self-reports (ADDHealth, 1996). Past studies often measure connectedness using academic outcomes as a proxy for connectedness. One limitation with this approach is that academic performance can be influenced by alternative factors, such as cognitive ability and school resources, which can be distinct from students' personal feelings about school. Therefore, we use student-report of their own perceptions of connectedness.

Students with strong feelings of school connectedness are less likely to engage in delinquent and disruptive behavior. They show lower rates of violence, substance use, and emotional distress (Resnick, 1997). School connectedness promotes education-related outcomes (Juvonen, 2007). Students who feel more connected to school experience increased academic motivation, higher school attendance and better classroom engagement, which together promote learning (Croninger & Lee, 2001; Goodenow, 1993; Klem & Connell, 2004; Lee & Smith, 1999; Ryan & Patrick, 2001).

Although there is evidence of the impact of school connectedness on a number of outcomes, less is known about its association with SEL engagement at school specifically. Given its link to classroom engagement (Croninger & Lee, 2001; Klem & Connell, 2004), students' positive feelings about school could contribute to higher SEL engagement. In the present study, we examine whether students who are more engaged with and connected to school show higher use of SEL techniques promoted as part of a school-wide intervention being implemented by teachers and other school personnel. By investigating whether high school connectedness among students is related to higher use

of SEL techniques, this study evaluates the importance of connectedness on intervention engagement.

Peer Network Centrality: Indegree and Outdegree

Peers are important influences in childhood (Hay et al., 2004). They can be impactful for well-being outcomes, and peer support is effective in increasing engagement in health interventions (Plenty & Mood, 2016). In one study of a peer support diabetes intervention, participants who partook in more peer support phone calls experienced better intervention outcomes related to blood glucose levels (Piette et al., 2013).

Previous research has also shown a link between popularity and positive academic outcomes in adolescents (Mihaly, 2009). Youth who are sociometrically popular are typically characterized as having high levels of prosocial characteristics such as kindness and cooperation (LaFontana & Cillessen, 2002). Due to the likeability of such children, sociometric popularity is related to having a greater number of friendships (Litwack et al., 2012). In early and middle childhood, academic achievement predicts peer acceptance (Véronneau et al., 2010), perhaps due to the fact that the characteristics that make a sociometrically popular child also promote academic engagement in the same youth (Laidra et al., 2007; Litwack et al., 2012). It is likely that the same traits that contribute to popularity and academic engagement also promote participation in SEL techniques, which in turn further reinforce popularity and academic achievement.

In the current study, we assess popularity using social network analysis (SNA). SNA is a technique used to map out relationships between people and to quantify these interpersonal ties (Wasserman & Faust, 1994; Zhang, 2010). It is a powerful method to show how well-connected students are in their social network, which for students, is

typically the school context. SNA provides a more objective assessment of peer connectedness and has been used to examine the relationship between peer relationships and several behavioral health outcomes, including delinquent behaviors, substance use and sleep (Li et al., 2019; Phua, 2011). In the current study, popularity is assessed via indegree, the count of how many friendship nominations a student receives.

Outdegree, the number of friends a student perceives that they have, is another complementary measure of connectedness derived from SNA. Whereas indegree reflects popularity, outdegree reflects a student's engagement with the peer network. Previous work has shown outdegree may be associated with intervention participation. Lindsey and colleagues found that for African American adolescents, larger social networks, suggesting greater numbers of friends, were related to increased use of school-based mental health services. Molloy Elreda and colleagues (Molloy Elreda et al., 2016) also found that higher peer connectedness as measured by network metrics was related to positive intervention outcomes (i.e. positive behavioral functioning). These findings held for both outdegree as well as indegree independently. These studies demonstrate that peer relationships are important for engagement in school services. The present study extends past work by investigating the role of peer network variables on usage of SEL techniques. Findings may have implications for SEL implementation in schools.

Current Study

We investigated whether feelings of connectedness, indegree, and outdegree, are related to individual's engagement in an SEL intervention in a sample of second through fifth graders at a rural elementary school. For the purposes of our study, we consider in-school SEL strategies as any techniques that are systematically taught and facilitated by

the school principal, counselors, or teachers as part of the school's SEL or mindfulness curricula. This includes SEL, mindfulness, coping, and any other emotional regulation strategies. Students completed baseline assessments when they reported on school connectedness and provided peer nominations. Following that, students completed daily reports of whether they engaged in any SEL activity that day. We specifically examined how indegree was related to the mean use of SEL techniques and the proportion of days when students used any techniques, across the school year.

Our research questions were as follows:

1. Is indegree related to mean technique use/proportion of technique days?

   Hypothesis 1: There will be a positive relationship between indegree and (a) mean technique use and (b) proportion of days with technique use.

2. Is outdegree related to mean technique use/proportion of technique days?

   Hypothesis 2: There will be a positive relationship between outdegree and (a) mean technique use and (b) proportion of days with technique use.

3. Is connectedness related to mean technique use/proportion of technique days?

   Hypothesis 3: There will be a positive relationship between connectedness and (a) mean technique use and (b) proportion of days with technique use.

4. Are associations examined in research questions 1, 2, and 3 moderated by grade?

   Hypothesis 4: The relationship between the predictor variables (indegree, outdegree, and connectedness) and mean technique use/higher proportion of days with technique use will be stronger for students that are in higher grades.

Method

Participants

The participants are second through fifth graders from an elementary school in rural central Pennsylvania. There was a total of 265 students at the elementary school, all of whom provided data as part of a large school-wide evaluation. There were thirteen classrooms with a mean N = 18.07 students in each classroom. The school body was 95.09% White. According to parent report data, 14.15% of households self-identified as working class and 85.85% of the household identified as middle class. Their detailed demographics can be found in Appendix 1. Of the 265 students, 100 students had parental consent for their data to be used for research purposes. All students also assented to participate.

Procedures

The data originated as part of a larger scale naturalistic evaluation of school led SEL interventions on student well-being and academic outcomes. SEL curricula were comprised of frequent lessons from the school guidance counselor, as well as daily reinforcement of SEL by the teachers. The lessons are a combination of curriculum and strategies from Second Step Elementary. Lessons focused on emotion awareness, emotion regulation and coping. Students completed a baseline assessment in November 2020 and completed twice-daily surveys across the school year from December 2020 to May 2021 that probed daily use of SEL strategies that day, emotions, challenges in school, and feelings toward family and friends. A maximum of 115 days of data were collected. Students attended school in-person.

The baseline assessment included peer friendship nominations and self-report school connectedness items. The twice-daily surveys occurred at the beginning and end of each school day; at the end of day survey the students were asked to endorse up to ten SEL techniques they used. All of the surveys were administered online on Qualtrics. Links were access through classroom portal webpages. Each student had access to their own Chromebook at school.

Measures

School Connectedness

School connectedness was assessed with three items adapted from National Longitudinal Study of Adolescent to Adult Health (ADDHealth, 1996). During the baseline assessment, participants indicated how strongly they agree with the following statements: "I feel close to people at this school," "I am happy to be at this school," and "I feel like I am part of this school." (see Appendix B). Responses were rated on a one ("strongly disagree") to five ("strongly agree") Likert scale and summed to create a feeling of connectedness score (Cronbach's alpha = 0.86). There was no missingness across items in the analytical sample. Higher scores indicate higher connectedness.

Network Measures: indegree and outdegree

Participants were instructed to write five friends' first name and last initial of friends in their school (see Appendix C). These names were then cross checked with a school roster and replaced with a random four-digit id to anonymize the data. The remaining analyses were completed on the anonymized data.

The anonymized data was then used to calculate degree centrality. Actor degree centrality was treated as its two component parts, indegree and outdegree. Indegree was computed as the number of nominations a student received. The non-consented students contributed to indegree scores for all students. Outdegree was computed as the number of nominations a student gave. We then retained indegree and outdegree scores for only the consented participants.

Indegree and outdegree were calculated using the "igraph" package in R (Csardi & Nepusz, 2006). The outdegree measure was capped at five friendship nominations as a result of survey design. Network plots were created using R with the assistance of the "igraph" and "sna" packages (Butts, 2020).

SEL Technique Engagement

SEL interventions were school-led and included an array of techniques. Informed by strategies from Mindful Schools, Positive Behavioral Interventions and Supports, and the Second Step Program, school administrators, counselor, and teachers implemented an assortment of SEL interventions to students daily. At the end of each day, students reported daily SEL strategies by selecting which strategies they used from a provided list. These listed techniques were "belly breathing", "noticing and naming my feelings", "positive self-talk", "mindfulness", "problem solving", "using the calm down corner", "taking a walk or getting a drink", "talking to someone", "paying attention to my heart rate", and "paying attention to my body signals" (see Appendix D). Intervention engagement was computed as two different variables. The first enumerates the mean number of techniques a student used, on days when they completed an afternoon survey. The intraclass correlation coefficient (ICC), which represents the proportion of variance

accounted for by between class differences, was (ICC = 0.20). The second variable represents the number of days the participant used at least one technique over the days they completed an afternoon survey. The ICC for proportion of days with technique usage was (ICC = 0.09).

Control variables

Gender identity and grade were included as control variables. During the baseline survey, participants responded to "I am a", and could select "Boy", "Girl", or "Something else fits better". Of the 100 students who provided consent, 3 were excluded from the analysis because of our current focus on binary gender. An additional 1 was missing a report of school connectedness, and 7 for not completing a single afternoon survey, yielding an analytical sample of 89. The final analytical sample included 49% boys, 51% girls. The baseline survey also asked what grade they were in which was cross checked with school rosters. Parent report of student behavior was also initially considered as a covariate. This item was a composite of the two items "Compared to others of the same age, how well does your child: Do what caregivers request" and "See work through to the end". The responses were "Below average" (0), "Average" (1), and "Above average" (2). The correlation between the two items was 0.41. The two item scores were summed together in order to create the composite variable.

Analysis

We calculated descriptive statistics for the key variables (indegree, outdegree, school connectedness, mean technique use, proportion of days of technique use, gender, and grade) (Table 1). Next, we computed bivariate correlations for the variables to assess

their relationships to one another (Table 2). We then used multilevel regression models, with random intercepts to examine whether baseline indegree, outdegree, and school connectedness predicted two different indicators of technique use respectively: mean techniques used and proportion of days with one technique used (Cohen et al., 2003). Multilevel models nested students within classrooms to account for classroom level variation in technique use. Indegree, outdegree and connectedness were grand mean centered in all models. The grade variable was centered such that second grade was zero. First, six separate models examined the main effects of indegree, outdegree, and centrality on mean technique use and the proportion of days with technique use, with gender and grade included in each of these models as covariates. In the next three models, gender was included as a covariate and grade was tested as a moderator of the association between each of the predictors (i.e., indegree, outdegree, and connectedness) and mean technique use. We probed significant moderation effects by testing simple slopes at each grade following steps described by Preacher and colleagues (Preacher et al., 2006). Lastly, we tested gender as a moderator of the main effects in exploratory analyses.

Results

Indegree had a small, positive, non-significant correlation with proportion days when the children used techniques (r = .19). Outdegree was not correlated with SEL technique use. Finally, connectedness was weakly correlated with mean technique use (r =.24). We also explored the correlation between parent report of youth behavior SEL technique use to determine whether we should control for youth behavioral problems in our models.

Given its lack of correlation with mean technique use or proportion or technique days, we did not include it as a covariate in subsequent analyses.

All additional analyses were completed in the multilevel framework, which nested youth by classrooms. First, we examined the main effects of indegree, outdegree and connectedness on the mean number of techniques participants used over above grade and gender in three separate models (Table 3, Model A). Indegree, outdegree, or connectedness did not predict mean technique usage. Grade significantly predicted mean technique usage in all models such that younger students were using more techniques on average than older students.

The next three models assessed whether indegree, outdegree and connectedness, were associated with the proportion of days when youth used at least one technique (Table 3, Model C). Indegree predicted the proportion of days a technique was used (B = 0.04, SE = 0.01, p = 0.012), such that higher indegree predicted higher proportion of days when at least one technique was used. The main effect of grade was once again significant across all models such that younger students were using techniques on a larger proportion of days.

Then, we examined whether the associations between indegree, outdegree and connectedness and mean technique usage were moderated by grade (Table 3, Model B). Grade significantly moderated the association between connectedness and mean technique use (B = 0.12, SE = 0.05, p = 0.02). As shown in Figure 1, worse connectedness was associated with greater use of techniques among 2nd graders (B = -0.26, p > 0.01) but not 3rd, 4th, and 5th. Grade did not moderate the effects of indegree and outdegree on mean technique use. Likewise, grade did not moderate the associations

between indegree, outdegree and connectedness and proportion of days of technique use (see Table 3, Model D).

Lastly, we explored the two-way interaction between the predictors (indegree, outdegree, connectedness) and gender, and three-way interaction between the predictors, grade and gender in the prediction of mean technique use and proportion of days of use (Appendix G and H). Gender was not a significant moderator of the association between the predictor variables and the two outcome variables.

Discussion

The current study aimed to investigate whether feelings of connectedness, indegree, and outdegree are related to individual's engagement in an SEL intervention in second through fifth graders at a rural elementary school. For the purposes of our study, we consider in-school SEL strategies as any techniques that are systematically taught and facilitated by the school principal, counselors, or teachers as part of the school's SEL or mindfulness curricula, including mindfulness, coping, and any other emotional regulation strategies. We hypothesized that high levels of connectedness would be associated with higher individual engagement. Additionally, we anticipated that indegree and outdegree would be associated with more individual SEL technique usage. Consistent with our hypothesis, we found that youth with greater levels of indegree used SEL techniques on a greater proportion of days. Moreover, lower levels of self-reported connectedness were associated with greater mean levels of technique use, only among second grade.

Worse school connectedness was related to greater mean technique usage for second graders, but not third, fourth, and fifth graders, contrary to our hypothesis that higher connectedness would be related to higher mean technique usage in older children. This

could be due to a number of factors. First worse connectedness is related to more disruptive behaviors (Juvonen, 2007). Youth who are disruptive in class are likely to elicit reminders about emotional management strategies from teachers (Stage & Quiroz, 1997). In particular, younger children are still being taught the skills for emotional regulation which requires active guidance from educators (Denham et al., 2012). Disruptive behaviors in older grades may present differently and such behaviors may not prompt teacher SEL intervention in the same way as younger children's disruptive behaviors do (Forehand & Wierson, 1993). Rather than redirect students to attempt an SEL strategy during moments of disruptions, teachers of older students may choose to ignore disruptions, or punish students using non SEL strategies (i.e., detention, sitting out from class activities).

In order to further investigate whether disruptive behaviors could be driving our effects, we examined the correlation between parent reported child behavior problems and SEL technique use and found no significant correlation. However, teacher experiences of child behavior have been shown to deviate significantly from parent reports (De Los Reyes & Kazdin, 2005). Despite the lack of association with parent reports, it is plausible that teachers would report high levels of disruptive behaviors among the younger students who engaged in high levels of SEL strategies. Integration of teacher report of child behaviors could illuminate child behavior as an important influence on SEL usage.

In contrast to connectedness, youth with higher indegree (i.e., more popularity) reported using SEL strategies on a greater proportion of school days, consistent with our hypothesis. It could be that youth who are more sociometrically popular are more

engaged with school and school-based activities. This link has been shown in previous research. Among high school students, popularity was related to positive academic outcomes (Mihaly, 2009). The current study used objective measures of popularity and ecologically valid assessments of SEL intervention participation, to further examine these associations in younger children. We did not find associations between outdegree or gender with SEL usage. It is notable that indegree, outdegree, and connectedness all yielded different associations with SEL usage. This suggests that all three metrics are reflecting different aspects of school and peer connectedness. This tells us that the method with which a researcher chooses to assess these types of constructs matters quite a bit. Connectedness is related to school specifically, while indegree and outdegree are related to peer relationships. Finally, grade had an overall main effect across all models. Younger grades are using more techniques on average and are using techniques a larger proportion of days potentially also as a result of teacher prompting. This suggests that younger students are especially open to SEL based strategies for positive development and regulation.

Our study sample was majority White, which limits the study's generalizability to other races and ethnicities. Nonetheless, the study focused on SEL in rural children, a group that is often understudied and underserved by mental health services (Human & Wasem, 1991; Ziller et al., 2010). This study is conducted on the 38% of students whose parents provided consent for research publications, which may also limit the generalizability of the study findings to the other students at the school and all American youth of this age. However, visual examinations of network plots provided some assurance of even distribution of consented youth among the school population

(Appendix F). While only 89 participants were used for analyses, the network variables were calculated using peer nomination information from all students in the 2nd to 5th grades. Unfortunately, we had to exclude the 3 other-gender or non-binary youth, limiting our ability to draw conclusions about youth who did not identify as a girl or a boy. Additionally, due to the nature of longitudinal data collection, there was missingness in daily reports of SEL techniques. There is a potential that the students with large amounts of missingness are systematically different than their counterparts, and this may have impacted their SEL use composite scores. Students were limited to selecting five friends and there was minimal variation in how many friends were selected.

Despite these limitations, findings help illuminate how use of SEL techniques varies by grade and connectedness to schools. Younger students who feel the most disconnected to school are using techniques the most. The findings have implications of intervention creation and implementation. School connectedness and school climate are potentially powerful pathways to heighten intervention engagement in middle childhood and beyond. Additionally, if higher levels of network centrality are related to higher intervention engagement, targeting improvements in peer connectedness may be more important strategy for bolstering intervention effects. Future explorations of student and peer factors are crucial for improving the uptake of efficacious universal interventions in naturalistic settings.

Table 1
Descriptive Statistics

Variable	*n*	*M*	*SD*	Median	Min	Max
Indegree	89	3.99	2.43	4	0	10
Outdegree	89	3.74	1.43	4	0	5
Connectedness	89	12.45	2.99	13	3	15
Grade	89	3.47	1.17	3	2	5
Gender	89	1.51	0.50	2	1	2
Parent Report Behavior	89	2.26	0.72	2	1	4
Mean Techniques	89	0.47	0.34	0.48	0.02	1
Proportion of Technique Days	89	1.48	1.75	0.82	0.02	7.5

Table 2

Correlation Matrix

Variable	*M*	*SD*	1	2	3	4	5	6
1. Indegree	3.99	2.43						
2. Outdegree	3.74	1.43	.45**					
3. Connectedness	12.45	2.99	.25*	.14				
4. Grade	3.47	1.17	.18	.21*	.12			
5. Gender	1.51	.50	.01	.21*	.04	-.12		
6. Proportion of Technique Days	.47	.34	.19	.01	.02	-.34**	.21*	
7. Mean Techniques	1.48	1.75	.10	-.01	-.24*	-.43**	.10	.67**

*Note. M and SD are used to represent mean and standard deviation, respectively, * p < .05. ** p < .01.*

Table 3

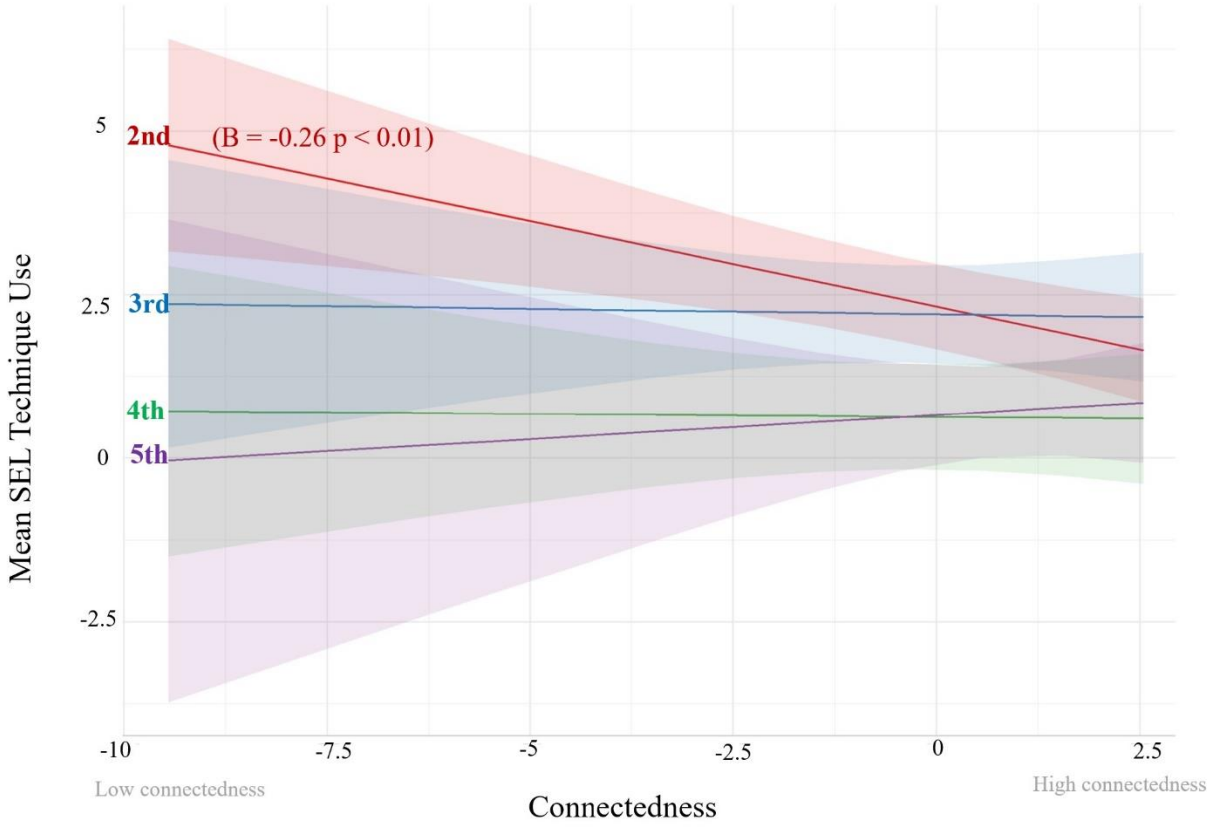
Associations between Indegree, Outdegree, and Connectedness and Technique Usage

		Mean Technique Use				Proportion of Days			
		Model A		Model B		Model C		Model D	
		B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI	B (SE)	95% CI
Indegree	Indegree	0.12(0.07)	(0, 0.27)	0.12(0.12)	(-0.09, 0.35)	0.04(0.01)*	(0.01, 0.06)	0.01(0.02)	(-0.03, 0.06)
	Female	0.15(0.34)	(-0.5, 0.81)	0.15(0.34)	(-0.50, 0.81)	0.11(0.07)	(-0.02, 0.24)	0.11(0.06)	(-0.01, 0.24)
	Grade	-0.68(0.15)**	(-0.97, -0.4)	-0.68(0.16)**	(-0.97, -0.40)	-0.11(0.03)***	(-0.16, -0.05)	-0.11(0.03)***	(-0.17, -0.06)
	Indegree x Grade	--	--	.00(0.06)	(-0.12, 0.12)	--	--	0.02(0.01)	(-0.01, 0.04)
Outdegree	Outdegree	0.08(0.12)	(-0.16, 0.33)	-0.03(0.18)	(-0.39, 0.33)	0.01(0.03)	(-0.04, 0.06)	-0.02(0.04)	(-0.09, 0.05)
	Female	0.12(0.35)	(-0.57, 0.79)	0.09(0.35)	(-0.59, 0.77)	0.11(0.07)	(-0.03, 0.25)	0.10(0.07)	(-0.03, 0.24)
	Grade	-0.64(0.17)**	(-0.97, -0.30)	-0.69(0.18)**	(-1.04, -0.33)	-0.10(0.03)*	(-0.16, -0.04)	-0.11(0.03)**	(-0.18, -0.05)
	Outdegree x Grade	--	--	0.09(0.11)	(-0.13, 0.32)	--	--	0.03(0.02)	(-0.02, 0.07)
Connectedness	Connectedness	-0.11(0.06)	(-0.22, 0)	-0.23(0.08)**	(-0.38, -0.09)	0.01(0.01)	(-0.02, 0.03)	-0.01(0.02)	(-0.04. 0.03)
	Female	0.20(0.33)	(-0.44, 0.86)	0.10(0.33)	(-0.53, 0.74)	0.11(0.07)	(-0.02, 0.25)	0.12(0.07)	(-0.03, 0.24)
	Grade	-0.59(0.16)**	(-0.89, -0.26)	-0.66(0.15)**	(-0.93, -0.37)	-0.10(0.03)*	(-0.16, -0.04)	-0.10(0.03)*	(-0.16, -0.04)
	Connectedness x Grade	--	--	0.12(0.05)*	(0.02, 0.23)	--	--	0.01(0.01)	(-0.01, 0.03)

*Note. * p < .05. ** p < .01, *** p < .001*

Figure 1

Predicted Values of Mean Technique Use by Grade and Connectedness



Appendix A

Demographics

Variable	*n*	%
Grade		
2nd	25	28%
3rd	21	24%
4th	19	21%
5th	24	27%
Gender Identity		
Boy	44	49%
Girl	45	51%
Student Report Race/Ethnicity		
White	75	84%
Non-white	10	11%
Abstained	4	4%

Appendix B

Connectedness Measure

How strongly do you agree or disagree with the following statements?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I feel close to people at this school	○	○	○	○	○
I am happy to be at this school	○	○	○	○	○
I feel like I am a part of this school	○	○	○	○	○

Appendix C

Peer Nominations Measure

Please list up to five close friends in your classroom. List their first name and last initial.

1.	
2.	
3.	
4.	
5.	

Appendix D

Daily SEL Technique Use Measure

Did you use any of the following strategies today? (Click all that apply)

- ☐ Belly Breathing
- ☐ Noticing and naming my feelings
- ☐ Positive self-talk
- ☐ Mindfulness
- ☐ Problem solving
- ☐ Using the calm down corner
- ☐ Taking a walk or getting a drink
- ☐ Talking to someone
- ☐ Paying attention to my heart rate
- ☐ Paying attention to my body signals

Appendix E

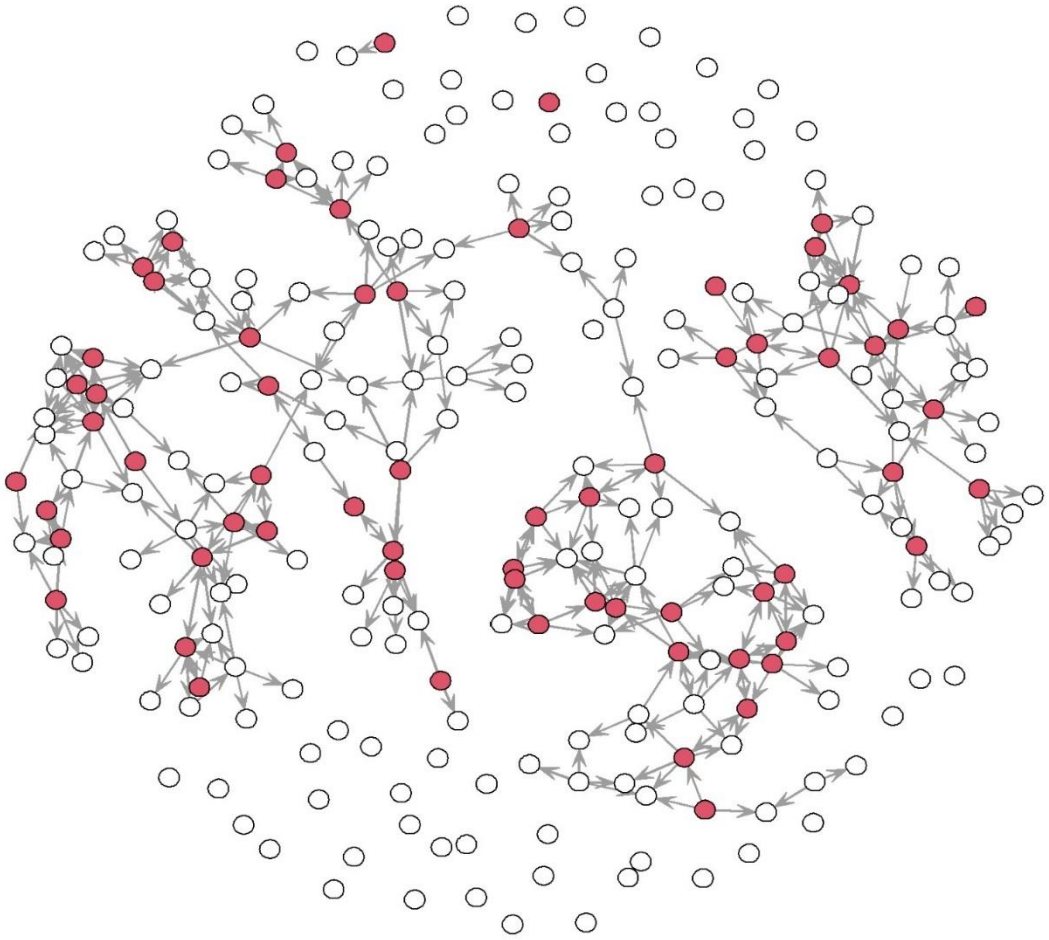
Parent Report of Child Behavior Measure

19. Tell us about your child

Compared to others of the same age, how well does your child:	Below average	Average	Above average
Do what caregivers request	◯	◯	◯
See work through to the end	◯	◯	◯

Appendix F

Social Network Plot of Student Consent



Note. Red = Students with parents' consent to use data for publication, White = Students without parental consent

Appendix G

Two-Way Interactions between the Predictor Variable and Gender

Two-way interaction models: Mean Techniques

Indegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Indegree	0.30	0.28	-0.25	0.83	0.30
Female	0.17	0.34	-0.48	0.83	0.62
Grade	-0.67	0.16	-0.97	-0.36	0.00
Indegree*Female	-0.10	0.15	-0.38	0.19	0.50
Indegree*Grade	-0.01	0.07	-0.01	0.04	0.85

Outdegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Outdegree	0.62	0.41	-0.20	1.40	0.13
Female	0.26	0.36	-0.44	0.94	0.48
Grade	-0.66	0.19	-1.02	-0.28	0.01
Outdegree*Female	-0.43	0.24	-0.89	0.06	0.08
Outdegree*Grade	0.06	0.11	-0.16	0.28	0.62

Connectedness					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Connectedness	-0.40	0.20	-0.78	-0.02	0.04
Female	0.09	0.33	-0.54	0.73	0.78
Grade	-0.66	0.14	-0.94	-0.39	0.00
Connectedness*Female	0.10	0.11	-0.11	0.32	0.36
Connectedness*Grade	0.13	0.05	0.03	0.24	0.02

Two-way interaction models: Proportion of Technique Days

Indegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Indegree	0.03	0.06	-0.07	0.14	0.54
Female	0.12	0.07	-0.01	0.24	0.09
Grade	-0.11	0.03	-0.17	-0.06	0.00
Indegree*Female	-0.01	0.03	-0.07	0.04	0.67
Indegree*Grade	0.01	0.01	-0.01	0.04	0.29

Outdegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Outdegree	0.07	0.08	-0.10	0.22	0.44
Female	0.13	0.07	-0.02	0.27	0.09
Grade	-0.11	0.04	-0.17	-0.05	0.01
Outdegree*Female	-0.06	0.05	-0.15	0.04	0.24
Outdegree*Grade	0.02	0.02	-0.02	0.07	0.32

Connectedness					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Connectedness	-0.01	0.04	-0.09	0.07	0.80
Female	0.11	0.07	-0.03	0.24	0.14
Grade	-0.10	0.03	-0.16	-0.04	0.01
Connectedness*Female	0.00	0.02	-0.04	0.05	0.89
Connectedness*Grade	0.01	0.01	-0.01	0.03	0.30

Appendix H

Three-Way Interactions between the Predictor Variable, Gender and Grade

Three-way interaction models: Mean Techniques

Indegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Indegree	1.20	0.84	-0.53	2.75	0.16
Grade	-1.24	0.49	-2.21	-0.33	0.01
Female	-1.21	1.08	-3.27	0.86	0.27
Indegree*Grade	-0.24	0.22	-0.64	0.21	0.28
Indegree*Female	-0.65	0.49	-1.55	0.37	0.19
Grade*Female	0.37	0.30	-0.19	0.95	0.21
Indegree*Grade*Female	0.14	0.13	-0.13	0.39	0.28

Outdegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Outdegree	2.58	1.25	0.11	4.92	0.04
Grade	-1.16	0.51	-2.13	-0.21	0.03
Female	-0.98	1.09	-3.07	1.10	0.37
Outdegree*Grade	-0.53	0.36	-1.21	0.18	0.15
Outdegree*Female	-1.68	0.75	-3.09	-0.21	0.03
Grade*Female	0.31	0.32	-0.29	0.92	0.32
Outdegree*Grade*Female	0.36	0.22	-0.08	0.78	0.11

Connectedness					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Connectedness	-1.24	0.56	-2.31	-0.18	0.03
Grade	-1.22	0.47	-2.11	-0.34	0.01
Female	-1.15	1.05	-3.14	0.84	0.28
Connectedness*Grade	0.33	0.17	0.00	0.65	0.06
Connectedness*Female	0.49	0.35	-0.17	1.14	0.16
Grade*Female	0.38	0.29	-0.17	0.92	0.20
Connectedness*Grade*Female	-0.13	0.11	-0.34	0.07	0.23

Three-way interaction models: Proportion of Technique Days

Indegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Indegree	0.15	0.17	-0.17	0.47	0.37
Grade	-0.24	0.10	-0.42	-0.05	0.02
Female	-0.17	0.21	-0.57	0.24	0.43
Indegree*Grade	-0.02	0.04	-0.10	0.06	0.61
Indegree*Female	-0.10	0.10	-0.29	0.08	0.30
Grade*Female	0.08	0.06	-0.03	0.19	0.19
Indegree*Grade*Female	0.02	0.03	-0.03	0.07	0.38

Outdegree					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Outdegree	0.24	0.26	-0.29	0.72	0.37
Grade	-0.21	0.11	-0.41	-0.01	0.05
Female	-0.11	0.23	-0.55	0.32	0.63
Outdegree*Grade	-0.04	0.08	-0.18	0.12	0.64
Outdegree*Female	-0.19	0.16	-0.48	0.13	0.24
Grade*Female	0.07	0.07	-0.06	0.19	0.33
Outdegree*Grade*Female	0.03	0.05	-0.06	0.12	0.46

Connectedness					
Effect	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
Connectedness	-0.10	0.12	-0.33	0.13	0.40
Grade	-0.20	0.10	-0.39	-0.01	0.05
Female	-0.12	0.22	-0.54	0.31	0.61
Connectedness*Grade	0.03	0.04	-0.03	0.10	0.34
Connectedness*Female	0.05	0.07	-0.09	0.19	0.51
Grade*Female	0.07	0.06	-0.05	0.18	0.29
Connectedness*Grade*Female	-0.02	0.02	-0.06	0.03	0.50

References

ADDHealth. (1996). School Connectedness Scale.

Allen, K., Kern, M. L., Vella-Brodrick, D., Hattie, J., & Waters, L. (2018). What Schools Need to Know About Fostering School Belonging: a Meta-analysis. *Educational Psychology Review*, *30*(1), 1-34. https://doi.org/10.1007/s10648-016-9389-8

Butts, C. T. (2020). *sna: Tools for Social Network Analysis*. In https://CRAN.R-project.org/package=sna

CDC. (2009). School connectedness: Strategies for increasing protective factors among youth. In: Atlanta, GA: US Department of Health and Human Services.

Croninger, R. G., & Lee, V. E. (2001). Social Capital and Dropping Out of High School: Benefits to At-Risk Students of Teachers' Support and Guidance. *Teachers College Record*, *103*, 548-581.

Csardi, G., & Nepusz, T. (2006). *The igraph software package for complex network research*. In Complex Systems 1695. https://igraph.org

Dane, A. V., & Schneider, B. H. (1998). PROGRAM INTEGRITY IN PRIMARY AND EARLY SECONDARY PREVENTION: ARE IMPLEMENTATION EFFECTS OUT OF CONTROL? *Clinical Psychology Review*, *18*(1), 23-45. https://doi.org/https://doi.org/10.1016/S0272-7358(97)00043-3

De Los Reyes, A., & Kazdin, A. E. (2005). Informant Discrepancies in the Assessment of Childhood Psychopathology: A Critical Review, Theoretical Framework, and Recommendations for Further Study. *Psychological Bulletin*, *131*(4), 483-509. https://doi.org/http://dx.doi.org/10.1037/0033-2909.131.4.483

Denham, S. A., Bassett, H. H., & Zinsser, K. (2012). Early Childhood Teachers as Socializers of Young Children's Emotional Competence. *Early Childhood Education Journal*, *40*(3), 137-143. https://doi.org/10.1007/s10643-012-0504-2

Durlak, J. A. (2016). Programme implementation in social and emotional learning: basic issues and research findings. *Cambridge Journal of Education*, *46*(3), 333-345. https://doi.org/10.1080/0305764x.2016.1142504

Durlak, J. A., Dymnicki, A. B., Taylor, R. D., Weissberg, R. P., Schellinger, K. B., Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Schellinger, K. B., & Taylor, R. D. (2011). School-based universal interventions. *Child Development*, *82*(1), 405-432.

Elbertson, N. A., Brackett, M. A., & Weissberg, R. P. (2010). School-Based Social and Emotional Learning (SEL) Programming: Current Perspectives. In (pp. 1017-1032). Springer Netherlands. https://doi.org/10.1007/978-90-481-2660-6_57

Elias, M. J., Maruce J. Elias, J. E. Z. R. P. W., Zins, J. E., Weissberg, R. P., Frey, K. S., Greenberg, M. T., Haynes, N. M., Kessler, R., Schwab-Stone, M. E., & Shriver, T. P. (1997). *Promoting Social and Emotional Learning: Guidelines for Educators*. Association for Supervision and Curriculum Development. https://books.google.com/books?id=AOlqSwQPo9cC

Forehand, R., & Wierson, M. (1993). The role of developmental factors in planning behavioral interventions for children: Disruptive behavior as an example. *Behavior Therapy*, *24*(1), 117-141. https://doi.org/10.1016/s0005-7894(05)80259-x

Frydenberg, E., Care, E., Freeman, E., & Chan, E. (2009). Interrelationships between coping, school connectedness and wellbeing. *Australian Journal of Education*, *53*(3), 261-276. https://doi.org/10.1177/000494410905300305

Goodenow, C. (1993). Classroom Belonging among Early Adolescent Students. *The Journal of Early Adolescence*, *13*(1), 21-43. https://doi.org/10.1177/0272431693013001002
Hay, D. F., Payne, A., & Chadwick, A. (2004). Peer relations in childhood. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, *45*(1), 84-108. https://doi.org/10.1046/j.0021-9630.2003.00308.x
Human, J., & Wasem, C. (1991). Rural mental health in America. *American Psychologist*, *46*(3), 232-239. https://doi.org/10.1037/0003-066X.46.3.232
Jones, S., Bailey, R., Brush, K., & Kahn, J. (2018). Preparing for effective SEL implementation. *Harvard Graduate School of Education Easel Lab. Available from Wallace Foundation website: https://www. wallacefoundation. org/knowledgecenter/Documents/Preparing-for-Effective-SEL-Implementation. pdf.*
Juvonen, J. (2007). Reforming Middle Schools: Focus on Continuity, Social Connectedness, and Engagement. *Educational Psychologist*, *42*(4), 197-208. https://doi.org/10.1080/00461520701621046
Klem, A. M., & Connell, J. P. (2004). Relationships Matter: Linking Teacher Support to Student Engagement and Achievement. *Journal of School Health*, *74*(7), 262-273. https://doi.org/10.1111/j.1746-1561.2004.tb08283.x
LaFontana, K. M., & Cillessen, A. H. N. (2002). Children's perceptions of popular and unpopular peers: A multimethod assessment. *Developmental Psychology*, *38*(5), 635-647. https://doi.org/http://dx.doi.org/10.1037/0012-1649.38.5.635
Laidra, K., Pullmann, H., & Allik, J. (2007). Personality and intelligence as predictors of academic achievement: A cross-sectional study from elementary to secondary school. *Personality and Individual Differences*, *42*(3), 441-451. https://doi.org/10.1016/j.paid.2006.08.001
Lee, V. E., & Smith, J. B. (1999). Social Support and Achievement for Young Adolescents in Chicago: The Role of School Academic Press. *American Educational Research Journal*, *36*(4), 907-945. https://doi.org/10.2307/1163524
Li, X., Kawachi, I., Buxton, O. M., Haneuse, S., & Onnela, J.-P. (2019). Social network analysis of group position, popularity, and sleep behaviors among U.S. adolescents. *Social Science & Medicine*, *232*, 417-426. https://doi.org/10.1016/j.socscimed.2019.05.026
Litwack, S. D., Aikins, J. W., & Cillessen, A. H. N. (2012). The Distinct Roles of Sociometric and Perceived Popularity in Friendship. *The Journal of Early Adolescence*, *32*(2), 226-251. https://doi.org/10.1177/0272431610387142
Mahoney, J. L., Durlak, J. A., & Weissberg, R. P. (2018). An update on social and emotional learning outcome research. *The Phi Delta Kappan*, *100*(4), 18-23. https://www-jstor-org.ezaccess.libraries.psu.edu/stable/26552480
Masten, A. S., & Coatsworth, J. D. (1998). The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *American Psychologist*, *53*(2), 205-220. https://doi.org/http://dx.doi.org/10.1037/0003-066X.53.2.205
McClelland, M. M., Tominey, S. L., Schmitt, S. A., & Duncan, R. (2017). SEL Interventions in Early Childhood. *Social and Emotional Learning*, *27*, 33-47. https://doi.org/10.2307/44219020
McNeely, Nonnemaker, & Blum. Promoting school connectedness: Evidence from the national longitudinal study of adolescent health. *The Journal of School Health*, *72*(4), 138-146. https://doi.org/http://dx.doi.org/10.1111/j.1746-1561.2002.tb06533.x

Mihaly, K. (2009). Do More Friends Mean Better Grades? , *WR-678*, 1-28.
Molloy Elreda, L., Coatsworth, J. D., Gest, S. D., Ram, N., & Bamberger, K. (2016). Understanding Process in Group-Based Intervention Delivery: Social Network Analysis and Intra-entity Variability Methods as Windows into the "Black Box". *Prevention Science*, *17*(8), 925-936. https://doi.org/10.1007/s11121-016-0699-3
Offord, D. R. (2000). Selection of levels of prevention. *Addictive Behaviors*, *25*(6), 833-842. https://doi.org/10.1016/s0306-4603(00)00132-5
Phua, J. (2011). The influence of peer norms and popularity on smoking and drinking behavior among college fraternity members: A social network analysis. *Social Influence*, *6*(3), 153-168. https://doi.org/10.1080/15534510.2011.584445
Piette, J. D., Resnicow, K., Choi, H., & Heisler, M. (2013). A diabetes peer support intervention that improved glycemic control: mediators and moderators of intervention effectiveness. *Chronic Illness*, *9*(4), 258-267. https://doi.org/10.1177/1742395313476522
Plenty, S., & Mood, C. (2016). Money, Peers and Parents: Social and Economic Aspects of Inequality in Youth Wellbeing. *Journal of Youth and Adolescence*, *45*(7), 1294-1308. https://doi.org/10.1007/s10964-016-0430-5
Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational Tools for Probing Interactions in Multiple Linear Regression, Multilevel Modeling, and Latent Curve Analysis. *Journal of Educational and Behavioral Statistics*, *31*(4), 437-448. https://doi.org/10.3102/10769986031004437
Resnick, M. D. (1997). Protecting Adolescents From Harm. *JAMA*, *278*(10), 823. https://doi.org/10.1001/jama.1997.03550100049038
Ryan, A. M., & Patrick, H. (2001). The Classroom Social Environment and Changes in Adolescents' Motivation and Engagement During Middle School. *American Educational Research Journal*, *38*(2), 437-460. https://doi.org/10.3102/00028312038002437
Stage, S. A., & Quiroz, D. R. (1997). A Meta-Analysis of Interventions to Decrease Disruptive Classroom Behavior in Public Education Settings. *School Psychology Review*, *26*(3), 333-368. https://doi.org/10.1080/02796015.1997.12085871
Véronneau, M.-H., Vitaro, F., Brendgen, M., Dishion, T. J., & Tremblay, R. E. (2010). Transactional analysis of the reciprocal links between peer experiences and academic achievement from middle childhood to early adolescence. *Developmental Psychology*, *46*(4), 773-790. https://doi.org/http://dx.doi.org/10.1037/a0019816
Wasserman, S., & Faust, K. (1994). *Social network analysis : methods and applications*.
Wingspread Declaration on School Connections. (2004). *Journal of School Health*, *74*(7), 233-234. https://doi.org/10.1111/j.1746-1561.2004.tb08279.x
Zhang, M. (2010). Social Network Analysis: History, Concepts, and Research. In B. Furht (Ed.), *Handbook of Social Network Technologies and Applications* (pp. 3-21). Springer US. https://doi.org/10.1007/978-1-4419-7142-5_1
Ziller, E. C., Anderson, N. J., & Coburn, A. F. (2010). Access to Rural Mental Health Services: Service Use and Out-of-Pocket Costs. *Journal of Rural Health*, *26*(3), 214-224. https://doi.org/10.1111/j.1748-0361.2010.00291.x
Zins, J. E., & Elias, M. J. (2007). Social and Emotional Learning: Promoting the Development of All Students. *Journal of Educational and Psychological Consultation*, *17*(2-3), 233-255. https://doi.org/10.1080/10474410701413152