

The Relationship between Adolescent Social Network Structure and
Perceptions of School Climate

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Abstract

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This study employed data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) to examine the relationship between school social network variables and adolescent student perceptions of school climate. School climate is a multi-dimensional construct that represents a student's feelings of connectedness with the school institution and social community. As a result, positive perceptions of school climate have been linked to improved outcomes across a broad spectrum of student life, including academics, social-emotional health, and pro-social behavior. While climate is frequently examined through school attributes, little research has been done to explain its relationship to the patterns of social relationships within the student population. As a student's perception of school climate, represented by their holistic impression and relationship with the institution of school, is so greatly dependent on the social context within which they are embedded, it is imperative to understand and explain the effect of network structure at the school level.

In response to this need, the purpose of this study is to explore the ways in which the structure of students' social relationships at a school level is associated with their perceptions of school climate. In order to understand the transactional relationship between climate and network structure, a quantitative cross-sectional design was used to examine data at the school level through standard and sequential predictor entry multiple linear regressions. In addition, interaction terms were created in order to understand the way that school size moderates this relationship. Significant transactional relationships with school climate were found with both school size and racial salience, while a significant interaction effect was found between school size and racial diversity. Results indicate important implications not only for school size, but the organizational makeup of social sub-divisions within the school. Recommendations for future research includes replication with a contemporary sample, alternate statistical methodology, and the design of network-based climate interventions.

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DEDICATION

For my mother and father, who give me the courage to try, the grace to fail, and the strength to succeed.

Chapter I: Introduction

In 2008, researchers prepared a report for the California Department of Education on the results of the statewide California School Climate Survey (CSCS) (Austin & Bailey, 2008). Utilizing two years of data collection (2004-06), the report synthesized perceptions of school climate from 67,901 teachers, administrators, and staff in 4,136 schools across 535 districts in the state. The results reinforced some of the key benefits and challenges highlighted by current research on school climate reform efforts: first, that fostering positive school climate produces a broad spectrum of positive, measurable academic outcomes (Austin & Bailey, 2008). As school climate is a holistic incorporation of many individual facets of school experience, these outcomes transcend many traditional measurements of performance (such as GPA, or standardized assessments), as they also manifest in the mechanisms by which students learn and develop. Secondly, the findings from the CSCS indicate that over the course of a student's development and trajectory through from elementary to high school, there is a concurrent decline in these mechanisms alongside multiple dimensions of school climate. This includes the indicators of a positive teaching and learning environment (achievement standards and expectations, caring staff-student relations, meaningful student participation), student behaviors that support learning (motivation, attendance, etc.), as well as perceptions of safety around issues of violence, substance use, and risky student behaviors. Finally, despite the decline in these factors from elementary to high school, there are also fewer and fewer policies and associated services to help address the negative outcomes that arise from these challenges. This includes not only a lack of concrete resources, but also an insufficient base of research on the specific etiology of school climate as it exists at both the individual and school level.

As indicated by the CSCS findings, adolescent perceptions of school climate have far-reaching effects on their social, academic, and developmental success. As supported in a growing body of research, positive school climate has been linked not only with promotive and protective factors related to positive self-concept, health social development, and increased connectedness school, but also with the reduction of risk factors such as substance use, mental health issues, and relational aggression and violence (Eliot, Cornell, Gregory, & Fan, 2010; Kirby, 2001; Kuperminc, Leadbeater, & Blatt, 2001a; Peterson & Skiba, 2001). Despite identifying a broad spectrum of positive outcomes, researchers have had difficulty pinpointing the underlying mechanisms that foster a students' perception of school climate (Freiberg, 1999; Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013a). As such, the findings from the CSCS survey are indicative of an overall need for a school climate reform, not only to address the systemic challenges that arise by the time a student enters high school, but to understand the mechanisms by which these challenges form and are propagated.

For adolescents, their network of friends and peers is not simply an important social context, but represents an integral component of their school experience (Anderson, 1982; Bandura, 2001; Padilla & Perez, 2003). A student's positive perception of the institution of school becomes contingent on the behaviors, attitudes, and identities that arise from their social relationships. As a result, from a student perspective, school climate is not merely the sum of multiple dimensions of school life, but becomes a synergistic entity of intrapersonal and environmental factors bound by social experiences (Cohen, McCabe, Michelli, & Pickeral, 2009). For this reason, research cannot hope to address the mechanisms of school climate by treating it as methodologically independent from the relational nature of student experiences. A relational perspective and social network methodology is essential to understand, and in

course, provide intervention for improving school climate. Through a deeper understanding of the social patterns and processes by which students perceive their school experience, future research can target the driving forces behind the development of positive school climate.

Chapter II: Literature Review

School Climate

Social cognitive theory asserts that a person's attitudes and behaviors is not defined by one objective reality, but by the perception of individual experiences (Bandura, 2001). In this way, the attitudes, behaviors, and subsequent outcomes of a student in school are subject to their perceptions of their school experience (Cook-Sather, 2002). Due to the natural diversity bred from specific differences (such as cultural norms, parenting styles, psychosocial adjustment, and physiological/genetic differences), each student's perception of the school experience is unique to the individual (Padilla & Perez, 2003; Schunk, 1989). Yet, the very nature of school is one that supports the transmission of knowledge and norms, collaborative interaction, and human learning and development; it is inherently a social commons. As such, the perception of the school experience is as much a collective social perception as it is an individual one (Bandura, 2001). As an amalgamation of individual attitudes, beliefs, and interpretations about the school environment, the perception of the experience is a product of both the individual and the school community with which they are a part. Similarly, for the individual, the atmosphere, feeling, or tone of a school it is more than the simple sum of individual, compartmentalized perceptions (Cohen et al., 2009; Freiberg, 1999; Homana, Barber, & Torney-purta, 2006). Specific aspects of the school experience such as social interactions with peers, academic expectations, teacher interactions and support, classroom structure, sense of belonging, and physical quality and character of the building, become generalized to a greater experience of School Climate, or, "the quality and character of school life" (Cohen et al., 2009).

Due to its complex conceptual underpinnings and broad scope, it has been challenging for researchers to settle on defining its specific components. Early school climate research focused

primarily on observable characteristics such as the organizational structure and the physical qualities of the school (Anderson, 1982; Cohen et al., 2009; Halpin & Croft, 1963). Since then, with the rise of ecological models of development, and an emphasis on positive and preventative interventions, research on school climate began to encompass additional spheres of school life; school climate began to be studied as a holistic composite of social, emotional, academic, and physical environments (Bronfenbrenner, 1997; Catalano, Berglund, Ryan, Lonczak, & Hawkins, 2002; Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Gauthier & Cole, 2004). The scope of school climate was expanding to encompass “patterns of people’s experiences of school life and reflects norms, goals, values, interpersonal relationships, teaching and learning practices, and organizational structures” (Cohen et al., 2009). Other scholars have emphasized the importance of learning and academic achievement (Howard, 1987), while others have defined it by the quality of interpersonal interactions (Loukas, Suzuki, & Horton, 2006). Others have defined climate as being ‘something that is in the air’ and creates a feeling about being in school (Mitchell, Bradshaw, & Leaf, 2010). The National Association of School Psychologists (NASP) focuses solely on positive climate, citing a study by the Yale Child Study Center to identify 15 characteristics of a positive school climate such as “Achievement Motivation” “Order and Discipline” and “Parent Involvement” (Haynes, Emmons, Ben-Avie, & Comer, 1996; Lehr, 2004). As interest in school climate has increased, the need for quantification and measurement have pushed a wide variety of associated characteristics into discrete categories. Institutions such as the National School Climate Center (NSCC) have divided specific aspects of school climate into four general spheres of school life: safety, relationships, teaching and learning, and the environment (Cohen et al., 2009; Fan, Williams, & Corkin, 2011). It is through association with these spheres that I have instead chosen to review and discuss the literature across a broad

spectrum of interpersonal, environmental, and cultural factors that contribute to the development of school climate. In turn, this will help position school climate not only as a positive outcome, but potentially as point of intervention and influence on the well-being of students.

Interpersonal Factors. Attending school is inherently a forced social experience that involves interactions with individuals across multiple levels and involving varying power dynamics (authority figures, social status, etc.). With the school institution acting as a melting-pot of social interaction and collaborative opportunities, interpersonal relationships become a fundamental structure that shapes the experience of students throughout their school years (Durlak et al., 2011; Osterman, 2000; Stipek, 2006). When nurtured, these relationships help individuals achieve social emotional personal growth, while collectively contributing to a positive, safe, and responsive school climate (Cohen, 2006). Consistent with this line of reasoning, research has shown that social skills are significant enablers to academic success, whereby students who possess strong social skills are more likely to profit from their educational experiences than those who do not (DiPerna, 2006). The NSCC cites the importance of relationships as a key factor in forming the school social ecology through, “group trends, for example, norms, expectations, and belief systems that shape individual experience and learning as well as influence all levels of relationships” (Thapa et al., 2013a). Within this interpersonal dimension of the school experience, relationships within and between students and teachers are salient factors in the development of overall school climate.

The friendships that students foster in school extend far beyond the benefit of external supports such as physical resources, attention, or knowledge (Payton et al., 2008). Peer dyad interactions become formative extensions and reflections of our personal cognitive, physiological, and social-emotional development (Parker, Rubin, Price, & DeRosier, 1995).

They contribute to the formation of a sense of our competencies, our limitations, and our most basic concept of self. In so doing, peer groups serve as a natural training ground for the navigation of more complex social systems, while providing security, belonging, and structure in the relational resources they provide. (Brown, Eicher, & Petrie, 1986; Parker et al., 1995). Peer relationships are vital to individual development, but also to the development and continued functioning of the school environment as well (Durlak et al., 2011). When a student attends school, the formation of peer relationships are elicited by, and contribute to, a complex institutional structure (Ryan, 2000). In this way, the social ecology of the school not only helps to define the quality and character of its relationships, but is also reinforced by the behaviors those relationships produce. This social-contextual reciprocity, the essential function of the school as a social institution, and the inherent value of healthy social development, all contribute to a significant influences that peer relationships have on the development of school climate. The nature of peer influence however, is not explicitly beneficial. The quality and character of interpersonal relationships can increase peer conflict, deviant affiliation, and foster negative attitudes or behaviors. As a result it is imperative that schools nurture positive, healthy relationships within their complex institutional structure.

Through improving the quality and character of relationships, researchers and educators have seen profound effects across multiple dimensions of school climate. With the success of practical outcomes from violence prevention and anti-bullying programs, schools have been able to address feelings of physical and emotional safety (Birkett, Espelage, & Koenig, 2009; Karcher, 2004; Peterson & Skiba, 2001). By encouraging positive peer relationships, researchers have shown pro-social learning environments to foster greater achievement and promote healthy social development (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000; King,

Vidourek, Davis, & McClellan, 2002; Stewart, 2003). As a result, school-wide social emotional learning programs are broad-spectrum efforts to address the greater academic, social, and developmental needs of the student body (Cohen, 2006; Durlak et al., 2011; Greenberg et al., 2003). The presence of positive social support has been found to act as an important buffer against the negative influences of stress from academic pressure (Dubow & Tisak, 1989), socioeconomic status (Malecki & Demaray, 2006), and peer victimization (Davidson & Demaray, 2007). By fostering strong interpersonal peer relationships, schools are able to improve safety, support relationships, and improve teaching and learning, all essential factors in the perception of school climate.

While peer relationships are fundamental in promoting positive school climate, relationships between teachers and students are also highly influential in a student's perception of safety, relationships, and certainly teaching and learning (Stipek, 2006). Teacher interactions can directly affect student motivation and engagement by encouraging positive behavior and emotional support (Skinner & Belmont, 1993). By fostering positive relationships with students, teachers improve the overall quality of their classrooms which in turn supports prosocial behavior among students (Wentzel, 1998), mediates academic risk factors (Croninger & Lee, 2001; Hamre & Pianta, 2001), and develops a sense of connectedness to the school environment (McNeely, Nonnemaker, & Blum, 2002). Teachers have a potent influence on the success and the future development of every student they interact with. As such, the relationship students have with their teachers is an integral component of every student's perception of school climate. Positive teacher-student relationships can foster a strong sense of belonging for students and help address the mistrust that many disenfranchised students may possess given prior experiences (Yeager et al., 2013).

Environmental Factors. One of the defining factors of school climate arises from the environmental context of school not only as a physical location, but as an institutional environment. When a student “goes to school” they are not only arriving at a location that possesses its own physical properties, aesthetics, and dimensions, but they are engaging with a system of complex institutional norms, attitudes, and expectations about learning. When taken together, these environmental factors create the contextual setting that affects various dimensions of school climate, including students’ perceptions of safety, academic success, and their bond or connection to the institution.

In recent years, there is a growing body of research regarding the impact of physical layout, facilities, and school size on students’ perceptions of school climate (Astor, Guerra, & Acker, 2010; Dellar, 1998; Uline & Tschannen-Moran, 2008). Studies of school violence indicate that the physical design of the school can play an important role in students’ perceptions of safety (Astor et al., 2010). Unsupervised school areas create opportunities for violence, substance use, risky behaviors, and bullying (Craig, Pepler, & Atlas, 2000). The “social dynamics” of how these spaces are supervised and populated by staff, teachers, and students is credited with greater feelings of safety while in school (Astor et al., 2010; Astor, Meyer, & Behre, 1999). In addition to the physical layout of the school, the physical condition and quality of the school facilities also play a role in both the perception of climate as well as academic outcomes. Through a survey and analysis of 80 Virginia middle schools, Uline & Tschannen-Moran (2008) found positive relationship between the quality of school facilities and student achievement in English and mathematics, with three areas of school climate acting as a mediating variable. This finding supports the need for further research into how the physical

environment is able to influence not only perceptions of the greater climate, but also the learning environment and academic success of the students.

In addition to the structural qualities of the school, the care of the physical environment or the cleanliness of the school has been shown to play a role in overall perceptions of school climate (American Psychological Association, 2003). Schools that have a physical environment that is well manicured and kept clean are likely to have students and staff who report feeling better about being at school. Moreover, the quality of the building itself has been shown to create a greater sense of school pride among students (Tanner & Langford, 2003). These findings reinforce the challenges in combating the systemic inequalities that plague many disadvantaged communities: Places with fewer resources are unable to repair or renovate their schools which lead to reduced perceptions of climate and lower achievement (Uline & Tschannen-Moran, 2008). Fortunately, this also indicates a potentially powerful pinpoint for intervention, as efforts can be undertaken in any setting to improve the care of the physical environment.

A school's size is another environmental factor that may also affect students' perception of school climate through feelings of connection to the school, academic performance, and feelings of increased safety (Cotton, 2001; Goodenow, Szalacha, & Westheimer, 2006a; Stevenson, 2006). Reviews of prior research concluded that smaller schools fostered better academic outcomes, greater feelings of social belonging, as well more positive perceptions of school climate (Cotton, 1996; Cotton, 2001). In addition, a large scale study by the National Longitudinal Study for Adolescent Health (n=75,151), found a positively association between small school size and feelings of connection to the school environment (Mcneely, Nonnemaker, & Blum, 2002). However, while the positive nature of smaller schools is generally supported, more recent literature has revealed deviations from this claim in specific student populations.

For example, in Gettys' (2003) analysis of 156 middle schools, she found no significant relationship between school size and school climate. In terms of academic benefit, while smaller schools appear to provide academic benefit to disadvantaged minority students, students from affluent families performed better in larger school settings (Howley, Strange, & Bickel, 2000). In addition, although smaller schools may benefit middle school students, larger schools produce greater academic performance at the elementary and high school levels (Stevenson, 2006). School size, while contributing to some elements of school climate, may play a more complex role depending on the population of students and the greater school community.

In addition to the school's physical characteristics, there are important environmental factors that are inherent to the students' relationship with school as an institution. One example of this is School Connectedness, a multidimensional construct that is associated with a student's feeling of attachment or belonging to school (Karcher, 2004; Loukas et al., 2006; Mcneely et al., 2002). In its essence, researchers believe school connectedness to be born from feelings social support, or "the belief by students that adults and peers in the school care about their learning as well as about them as individuals" (The Centers for Disease Control and Prevention, 2009). However, while forged from individual relationships, school connectedness is a belief that is generalized to represent a relationship with institution of school as a greater entity. Although regarded as a subfactor of school climate, school connectedness is itself multidimensional, as "a function of attachment, interpersonal social support, and group-level experiences of belonging" (Karcher, 2004).

Due to the deep integration with a student's school experience, school connectedness has been found to have potent effects on the various dimensions of school climate. Increased feelings of school connectedness have been linked with reduced violence (Karcher, 2004; Wilson, 2004),

improved academic achievement (Eisenberg, Neumark-Sztainer, & Perry, 2003; Karcher, Davis III, & Powell, 2002), and a host of positive school outcomes and protective factors (Bond et al., 2007; Shochet, Dadds, Ham, & Montague, 2006). This institutional relationship, while still a focus of current research, is an important factor in the greater perception of school climate as a representation of both a social community and a physical manifestation of positive support.

Cultural Factors. When addressing the development of school climate, cultural factors play an important role in understanding students' educational values, attitude toward achievement, and relationships with peers. While not a direct manifestation of any one dimension of school climate, the diversity of cultural norms, attitudes, and belief structures are fundamental in the construction of worldview. As a result, these cultural factors all affect a student's perception of school climate through their physical and emotional safety, ability to learn, interpersonal relationships, and their connection to the institutional environment.

One construct, school racial climate, or "how race, and how perceptions of race condition the interpersonal interactions that constitute climate" (Mattison & Aber, 2007) has been used to better understand these factors in a specific racial context. Although it is often an overlooked quality with regard to school climate, there is a growing body of research demonstrates the effect of racial climate on academic, social, and health related outcomes. Through an analysis of positive perceptions of racial climate, these perceptions were correlated to lower rates of discipline related referrals and higher academic achievement among African American and European American high school students (Mattison & Aber, 2007). Similarly, negative perceptions of racial climate have been shown to be a risk factor in academic performance and college preparation (Griffin & Allen, 2006). Through studies of peer to peer as well and teacher-student interracial relationships, the effects of racial climate were also shown to generalize to

greater perceptions of school as a community. Using a large sample of elementary and secondary schools in a major urban school district, researchers showed that positive interracial interactions contributed to sense of belonging to the community, while negative interactions detracted from that sense (Hallinan, Kubitschek, & Liu, 2009).

Racial and cultural factors not only contribute to the kind and quality of relationships, but are also instrumental in the individual interpretation of the type of support and resources that the school provides. For example Jia et al., (2009) demonstrated that when compared with students from China, American students perceive lower levels of teacher and student support, as well as opportunities for autonomy in the classroom. In addition, a study of 2,500 randomly selected Hispanic/Latino, White, and Asian middle school students demonstrated similar variations in expectation for teacher support. In this study, the responses of the Hispanic/Latino students varied from the White and Asian students, as they considered personal relationships with teachers more important than the modeling of positive behaviors (Schneider & Duran, 2010).

It is thought that variation in cultural values creates differing expectations in attitudes, relationships, and behaviors in the school environment, all contributing to variations in individual perceptions of climate. For example, through a study of African American and White middle school students, African American, poor, and female students perceived the school climate more negatively than did their White, non-poor, and male classmates (Watkins & Aber, 2009). As a result, while positive school climate is demonstrated to be a valuable asset for racial minority students, the perception of school climate itself is subject to significant variation based on the race of the student (Haynes, Emmons, & Ben-Avie, 1997; Koth, Bradshaw, & Leaf, 2008). Other research has shown that intentional efforts to improve the cultural sensitivity and competency of the staff results in greater academic engagement and success for minority

students, suggesting that these students felt better understood and accepted in this setting—a more positive perception of school climate (Bustamante & Nelson, 2007).

Protective Factors. Although school climate itself has been identified as a mediating buffer against the negative effects of violence, substance use, sexual behaviors, suicidal thoughts and behaviors, and emotional distress (Resnick MD, Bearman PS, Blum Rm, & et al, 1997), there is extensive empirical research that suggests that a positive school climate also has powerful effects on the promotion of factors that protect students against negative life outcomes. Due to the multi-dimensional nature of school climate, the resulting outcomes manifest across a broad spectrum of social, developmental, and contextual boundaries. As a result, intervention models that focus on multidimensional forms of support such as Positive Youth Development (Catalano et al., 2002), Character Education (Berkowitz & Bier, 2004), and Social Emotional Learning (Durlak et al., 2011) all emphasize the importance of positive school climate as an efficient, broad spectrum approach to health promotion and risk prevention. For a student, the most salient protective factors include increased academic achievement and school success, positive social relationships, mental health. Through the promotion of these factors, positive school climate helps facilitate a safe, healthy trajectory through an otherwise challenging school experience (Loukas & Murphy, 2007).

For a student, successful academic outcomes are closely tied with their perception of themselves as a student. Good grades, low absenteeism, and high motivation to perform academically are all qualities that are possessed successful, high performing students, and are recognized as such (Crosnoe, Riegle-Crumb, & Muller, 2007). By attaining these qualities, students are more likely to identify as learners and successful members of the school community, and this success reinforces that perspective (Marsh & Yeung, 1997; Wigfield & Eccles, 2002).

As a result, high academic achievement, academic self-concept, and associated successful school outcomes have been identified as a protective factor in the school environment (Fergusson & Lynskey, 1996; Wills, Vaccaro, & McNamara, 1992). Positive school climate has been found to increase academic achievement and school outcomes across populations and school environments. It produces higher performance academic performance (Brand, Felner, Shim, Seitsinger, & Dumas, 2003; Sterbinsky, Ross, & Redfield, 2006), promotes higher motivation and engagement (Ruus et al., 2007; Wentzel, 1998), and is associated with lower absenteeism, dropout rate, and delinquency (deJung & Duckworth, 1986; Gottfredson, 1986). Researchers theorize that by elevating the quality and character of school life, a school is able to better support its goal of educating its students (Cohen et al., 2009; Fan et al., 2011). By creating a more positive school climate there is less to impede the learning process, so education becomes more accessible.

Whether learned explicitly through curriculum or implicitly through natural interaction and observation, students gain empathy, learn norms of behavior, and practice social skills in the relationships they foster and navigate at school (Brown et al., 1986; Parker et al., 1995). The quality of these relationships becomes the foundation for a healthy development and successful life within and beyond the school environment. There is extensive research to support the importance of positive relationships in a student's life through the associated outcomes such as academic success (Elias & Haynes, 2008; McClelland, Morrison, & Holmes, 2000), healthy social development (Caprara et al., 2000; King et al., 2002; Stewart, 2003), improved self-concept (Caprara et al., 2000; Ryan, 2000), as well as amelioration of a wide array of potential risk factors (Birkett et al., 2009; Karcher, 2004; Peterson & Skiba, 2001). As a promotive factor, positive school climate has been shown to facilitate the development of healthy relationships

amongst peers (Cohen, 2006; Eliot et al., 2010; King et al., 2002), teachers and students (Hamre & Pianta, 2001; Stipek, 2006), and even between the teachers within a school (Beets et al., 2008). Through the foundation of social support, positive school climate provides support to students within the classroom and into their lives.

The emotional and mental health of a student acts as a lens through which they perceive the world. This perspective affects their decisions, behaviors, and interpretation of the events of their life. The development of positive self-concept and high self-efficacy, as well as the mitigation of self-criticism, depression, or anxiety are all recognized as a successful protective factor against potential negative personal or environmental factors (Benard, 1991; Catalano et al., 2002). Through the development of a safe environment, positive relationships, and a strong connection to the school institution, research indications that a positive school climate has a powerful impact on mental and emotional health (Bond et al., 2007; Catalano, Oesterle, Fleming, & Hawkins, 2004; Fan et al., 2011). This includes improved self-concept (Haynes et al., 1997), a buffering against self-criticism (Kuperminc, Leadbeater, & Blatt, 2001b), lower rates of depression and anxiety (Shochet et al., 2006), and the reduction of a number of associated mental health concerns in adolescence (Bond et al., 2007; Resnick MD et al., 1997). In the support and nourishment of mental health, a positive school climate is able to promote important protective factors in the development its students.

Risk Factors. In addition to fostering important protective factors, a positive school climate also leads to a reduction in school violence and aggression as well as a wide variety of risky health-related behaviors and mental health problems (Cohen et al., 2009; Fan et al., 2011; Thapa et al., 2013a). While often preventable, these risk factors are prevalent in schools and commonly associated with serious negative life outcomes. Studies indicate that a positive school

climate, through its foundations of safety, social and academic support, and connection to school, are associated with a significant reduction in these student risk factors.

School violence, bullying, and harassment are potent forms of negative school interactions that contribute to isolation, rejection, and unsafe feeling about school. According to the 2013 Center for Disease Control and Prevention High School Youth Risk Behavior Survey, nearly 20% of students report being bullied on school property, and 7% of students chose to miss school because of feeling unsafe (Kann, L., Kinchen, S., Shanklin, S. L., Flint, K. H., Kawkins, J., Harris, W. A., ... & Zaza, S., 2014). This does not include reports of cyberbullying (14.8%), and the large number of bullying cases that go unreported (Kann et al., 2014). Bullying and aggression are particularly common around issues of sexuality and gender identity, creating an unsafe environment for victims and the school community (Birkett et al., 2009; Goodenow, Szalacha, & Westheimer, 2006b; McGuire, Anderson, Toomey, & Russell, 2010). As a result, bullying has been shown to increase dropout rate, lower academic success, increase suicidal thoughts and behaviors, and cause a profound impact on student well-being and mental health (Bender & Lösel, 2011; Farmer & Xie, 2007; Lindstrom Johnson, Waasdorp, Debnam, & Bradshaw, 2013; Olweus, 1994; Orpinas & Horne, 2006).

With a national spotlight focusing on bullying in schools, recent research has emphasized the important role that positive school climate plays in the reduction of violence and relational aggression in school communities (Orpinas & Horne, 2006; Peterson & Skiba, 2001). In a survey of middle and high school students, school climate was demonstrated to be a significant predictor for lower rates of violence and aggression in schools (Wilson, 2004). LGBTQ students, often the target of bullying and violence, have also been shown to benefit from the effects of a positive school climate (Birkett et al., 2009; Goodenow et al., 2006b). The benefit of a positive school

climate is often accredited to the wide spectrum of support t provided by teachers and peers, but has also been linked specifically to feelings of school connectedness (Eisenberg et al., 2003; Karcher, 2004; Meneely et al., 2002). It is believed that through a stronger institutional relationship with school, students are more likely to rise to the norms and expectations of the community (Loukas et al., 2006). With a reduction in violence and aggression, the perception of school as a safe space may also help to reduce other risk behavior. For example, Klein, Cornell, and Konold (2012), using a sample of 3,687 high school students, found that positive school climate in association with reduced bullying and aggression was associated with lower student risk behaviors. Although the exact mechanisms by which school climate functions to reduce bullying and violence are still being explored, the effects on students' feeling of safety and overall school experience are profound.

As students reach adolescence, they are exposed to environmental and social conditions that present risks to their mental and physical health. While still undergoing cognitive and developmental growth, the ability to make safe choices around these risk factors can be challenging and often complicated by cultural and social pressures. For example, as of 2013, nearly 35% of high school students had drunk alcohol and 23% had reported using marijuana within 30 days of the survey (Kann et al., 2014). Within the past year, 8% of high school students reported having attempted suicide, and it remains the third leading cause of death in people between the ages of 10 and 24 (Kann et al., 2014). In regards to major negative school outcome, 7.4% of students were reported to have dropped out of high school in 2010, a factor that has been associated with serious negative outcomes (National Center for Education Statistics, 2012)

Fostered by a safe, structured, and responsive environment, a positive school climate is highly effective in reducing a wide array of these health risks including substance use, negative school outcomes, and mental health issues (Cohen et al., 2009; Fan et al., 2011; Thapa et al., 2013a). Findings from the National Longitudinal study of Adolescent Health suggested that increased school climate were protective against substance use, school violence, emotional distress, and suicidal thoughts and behaviors (Resnick MD et al., 1997). Among high school students specifically, a positive school climate is linked to lower levels of drug use and fewer self-reports of psychiatric problems (LaRusso et al., 2008), as well as lower rates of student suspension (Lee, Cornell, Gregory, & Fan, 2011). Bond et al. (2007) demonstrated similar findings, suggesting that a positive school climate lead to a reduction in smoking, drinking, using marijuana, as well as increased dropout rate and depressive and anxious symptoms (Bond et al., 2007). As research indicates, a positive school climate is essential in helping to reduce a student's risk of experiencing negative outcomes.

Relational and Non-Relational Methodologies

Particularly in schools, ecological frameworks and social learning perspectives are common foundations for educational research. Despite this orientation toward the inclusion of social context, the deviation from traditional scientific methodologies to allow for the measurement of this context has been a slow-going, if not monumental task (Carolan, 2013). In an ongoing struggle for scientific legitimacy, the social sciences have clung to the traditional sampling methodologies were inherited from its forefathers. These experimental designs, while clean in the identification of causal effects, strip the individual of the rich social construct that informs its actions, attitudes, and disposition. Furthermore, as the “gold standard” within educational psychology, its empirical quantitative focus disincentivizes the

measurement of group dynamics, interactions, or any variable that may suggest a qualitative hue (Walters, Lareau, & Ranis, 2009).

Relational Perspective

In order to best understand the limitations of traditional methodologies in the study of student social networks, it is important to examine the foundation of the “relational perspective” in the integration of network theory and method (Carolan, 2013). Moving farther from the clean, random samples of *actor-by-attribute* data, social network analysis offers more than a new design or set of mathematical techniques, but an inherently different theoretical paradigm: that human thought and behavior cannot be fully understood or measured when divorced from the social context within which they are embedded (Wellman & Berkowitz, 1988). To assume independence between structure and agency is to lose contextual data that may inform analysis with as much significance as the singular variables originally chosen for study. In this way, social network analysis forms an interdependent relationship between theory and method born from a common social ontology (Tilly, 2004).

One of the challenges in identifying a dominant ontology of social phenomena is the divide between the individual and the organizational social structure. This micro/macro schism is often ignored by the methodological individualism of traditional social research, which places the human individual at the heart of its own behavior and attitudes, devoid of structural social context. Tilly (2004) confronts this notion with the identification of *relational realism*, or the importance of interactions and social ties as the central existence of social life. This ontology of social phenomena is ideal in the conceptualization of social network analysis as it addresses the formation of organizational social structure (macro) through the actions of the individual (micro). Additionally, it provides a basic unit of

analysis, the social tie, as a fundamental building block for the practical application of scientific study. As a result, relational realism provides an ontological basis for the theoretical and methodological integration of social network analysis (Tilly, 2004).

This integration is reflected in several primary assumptions that guide the application of social network analysis in research. One assumption is that an individual's beliefs, perceptions, and behaviors are influenced by mechanisms inherent in the relational structure of social ties (Knoke, 2008). This is evidenced in theoretical models such as the theory of social capital, in which individuals "invest" in social relationships in order to gain access to desired resources. The mechanisms for these obtaining resources, either through consolidation in dense, norm-enforcing networks, or through brokerage in bridging strategic, "structural holes" are often ignored, or inaccessible by traditional methodologies (Portes, 1998). This assumption helps to guide research toward the inclusion of these mechanisms as contextual variables, while allowing a practical approach for their measurement and analysis.

Another assumption draws from this contextual nature of social network analysis, that is, that relations between individuals are specific to a context in both place and time (Carolan, 2013). This represents an uncomfortable break from traditional theories, by asserting a natural dynamic quality to the social organizational structures within which individuals are embedded. Through emphasis on both the individual and its interaction within a specific social context, these dynamics provide a direct manifestation of Tilly's (2004) relational realism. In the words of Carolan, "because social network analysis encompasses both social structure and individuals' agency, it provides the conceptual and methodological tools for linking behaviors at the actor level to larger embedded patterns at the macro level." (p. 36)

Finally, and arguably the most important assumption about social network analysis is that the quality and structure of social relationships are more important than specific attributes for understanding an individual's behavior, motivation, and attitudes (Knoke, 2008). This is not to say that attributes such as gender, race, age, etc. do not provide value in analysis, but they do not inform a deeper contextual picture of how an individual functions within different social structures. The same student, for example, will behave differently participating in a class discussion than they will on a baseball team. While the individual is the same, the social ties and the structural quality that exist in one context do not exist in another. The student may be a star academically but is reviled by his classmates, or he may perform poor athletically but is supported socially in the dugout. By applying traditional methodologies that reduce individuals and their attributes to singular units of analysis, researchers are only able to gather a narrow frame of understanding. By identifying how patterns of social relations influence behavior, this structural approach helps enliven the stale reliance on the role individual attributes. In educational research particularly, this offers valuable insight into the behaviors, motivations, and attitudes that arise from the rich, dynamic structure of student social networks.

Since Jacob Moreno's work in the 1930s that identified a network structure that contributed to the behavior of runaway girls, the analysis of social network structure has captured the attention of social scholars (Freeman, 2004). While the unmistakable graphical representations, or *sociograms*, and intuitive structural analysis are appealing, it is the complementary, unavoidable relational perspective that has settled on the periphery of modern social science. This perspective has driven a growing body of research toward the

necessary inclusion of contextual network factors that inform and revitalize prior research questions.

The advantage of applying a relational perspective to educational research is best represented through the comparison of similar research. One such area, the study of student resistance to teachers in the classroom, may be compared between a more traditional approach of Ogbu's (1987) cultural-ecological theory with McFarland's (2001) relational approach to the social-organizational structure of the classroom. Ogbu asserts that the nature of student resistance is rooted in the interaction of ecological contexts and cultural perspectives. This includes include the (mis)treatment of minorities in the institutional system of education, as well as those minorities reaction and response to this treatment (Ogbu, 1987). While an excellent examination of the cultural forces and inequalities inherent in the education system, it applies a broad lens to the issue of disengagement from the classroom. This focus on specific attributes of race, class, or cultural identity, even in the application of a complex contextual or structural ecological approach, still addresses the issue through examining common attributes between individual students.

Far from the top-down theoretical approach of Ogbu, McFarland (2011) approaches the issue of student resistance from someone entrenched in the pragmatic life of a classroom teacher: Why do students resist me? From a relational perspective, McFarland does not ignore the value of the *actor-by-attribute* approach, but instead seeks to incorporate the rich social context within which he is embedded (Carolan, 2013). Through an analysis of the social organization of classrooms, McFarland discovers that student resistance arises from interaction of instructional strategies with the opportunities afforded to influential students. When students occupy socially advantageous network positions during instruction that

allows for social discourse, it enables them to leverage their position to take advantage of opportunities that task structures define. This study of 36 schools over 1 year asserts that individual attributes such as race and class only play a partial role in acts of classroom resistance (McFarland, 2001). With the integration of social network analysis methods and theory, McFarland is able to uncover more of the social structural mechanisms that have been hindering educational reform.

Another excellent comparison of research is on the factors that contribute to adolescent high school student dropout. In a comprehensive study of the etiology of dropout as a long-term process of disengagement from school, Alexander et al., (2001) offers background risk factors (such as family SES, family type, and family stress level) that contribute the longitudinal course of student dropout. Analyzed at four school benchmarks in 1st grade, later elementary, middle school, and 9th grade, results indicated that personal, parental, and academic resources were associated with conditioning an individual student's chance to drop out (Alexander, Entwisle, & Kabbani, 2001). As with the application of Ogbu's theory on student resistance, there is nothing wrong with this traditional approach to explaining a very relevant issue in school reform. However, with the application of a relational perspective and the use of social network analysis, it is possible to acquire an additional understanding of the mechanisms that contribute to student dropout.

Ream and Rumberger (2008), in their work on the source of Mexican American and Latino student dropout, approach this problem from a relational perspective. Their results indicated that the social processes and behaviors around successful school completion are shared resources within social networks of students who prioritize school (Ream & Rumberger, 2008). The students who participated in school activities and joined school-

oriented social groups have a lower potential for school dropout, as the structural organization of these networks further promote school engagement. This combats the common notion that “street-oriented” friendships encouraged academic disengagement, but rather that Mexican American and Latino students were less engaged in school related opportunities and extracurricular events that offered access to school-oriented social networks. As is the case with Ream and Rumberger (2008), the use of network theory and methodology do not devalue the contributions of traditional studies, but rather contribute an additional, complementary relational perspective.

Finally, one of the best subjects for comparison in demonstrating the limitations of non-relational methodologies is the influence of peers on adolescent delinquent behavior. Adopting popular social theory in a traditional design, Agnew (1991) hypothesizes that peer delinquent behavior is conditioned by varying degrees of subjective characteristics within social peer relations. Through a regression analysis of the National Youth Survey, he found that specific characteristics of these peer relations (attachment to peers, time spent with peers, and patterns peer delinquent behavior) all play a role in determining delinquent behavior (Agnew, 1991). Agnew’s study is significant in that while he is adopting a relational perspective with regards to the individual (micro), he is not adopting network methods to allow for a structural understanding (macro) of how network characteristics may play a role in conditioning behavior. This is becomes clear the variation of behavior within and between groups of delinquent friends, such that not all members of the social network are affected in the same way.

Haynie (2001) contends that this variation may be a condition of the peer network structure within which the adolescents are embedded. Network characteristics such as

density, centrality, or popularity may be mediating the influence of peer delinquent behavior. Haynie addresses this hypothesis with a network perspective utilizing egocentric friendship networks constructed from the complete school networks of the National Longitudinal Study of Adolescent Health (Add Health). With friendship nominations from every student in a school as well as corresponding information from in-school and in-home questionnaires, Haynie is able to compare the structural characteristics of adolescent school relationships with the delinquent behavior of corresponding peers. The results indicated that while delinquent peers influence delinquency, the structural characteristics of density and centrality condition the delinquency-peer association (L. Haynie, 2001a). This study is an excellent example of how the extension of an integrated network perspective into prior literature can provide richer empirical explanations for a broad spectrum of educational outcomes.

Theories of Capital

In order to gain a clear understanding of the mechanisms and practical relevance behind the use of social capital in an educational setting, it is important to first explore the foundation of its theoretical roots and evolution. The term *capital* was born from the economic-political theory of Marx in his exposition on class division during the industrial age (Marx & Engels, 2002). It was used to describe the surplus value that is gained by the bourgeoisie (i.e., the class that controlled the means of production) through the circulation of commodities in the production and sale of goods. As the controlling class, the bourgeoisie is able to generate capital in the form of both surplus value that can be pocketed, as well as investment in the system of production with expectations of returns. In this theory, what Lin (1999) refers to as “classical theory of capital,” capital is both a product and a process, with the understanding that the gain and manipulation of capital is under the control of the bourgeoisie, or capitalists. While this is

primarily a mechanism used to explain the exploitation of one social class by another, the important qualities of capital as a surplus value and an investment inform its legacy to contemporary theory.

In Becker's (1964) work, he returned to the concept of capital without a stringent linkage to political ideology. In what began as the first of several neocapital theories, Becker introduced the concept of human capital theory as the investment in human qualities (such as education of the workers), for the expected future returns (greater earnings). This idea deviates from Marx' work specifically in the inherent nature of capital as a method of control in the polarization of bourgeoisie and proletariat (masses or laborers). In human capital theory, the investment of human capital is under the control of any class, and the expected future returns may represent non-monetary resources that still retain high value in the economic system (Becker, 1962). To use the example of education, a group of laborers may invest in greater training and education for their use on the job, with the expected return being not just an increase in pay for higher skilled work, but the leverage to negotiate for pay, benefits, and working conditions. Human capital, therefore, represents the degree of influence or leverages a person or group of people have on an environment.

Similarly, cultural capital, another branch of neoclassical capital theory, asserts that capital may exist as investments in the reproduction of symbols and meanings for the continued control of the dominant class over the dominated class (Bourdieu, 1986). One of the important elements of cultural capital theory, as described by Bourdieu, is that this investment takes place through the reproduction of these symbols and meanings on behalf of the dominant class, despite the unknowing participation of the dominated class. Schools act as conduits for the replication of these cultural products, "indoctrinating" the masses by reinforcing the value of

what will inevitably be retained by the dominant class. Cultural capital theory still allows for the dominated, “lower” class to misrecognize these symbols and meanings as their own, granting them returns from investments, even if it continues to unwittingly maintain the status quo through intergenerational transmission.

Theory of Social Capital

Theorists have borrowed heavily from Marx’ original economic blueprint and have been able to expand upon and generalize the idea of capital as having specific value and potential investment in other domains of human interaction and functioning. In the conceptualization of social capital, the application of neocapital theories have moved away from the doctrines of class subjugation and toward a functional system of how ideas, norms, and resources are fluidly exchanged in a social system (Carolan, 2013). Bourdieu’s application of social capital fell into accordance with his theories around economic and cultural capital, specifically as an investment by the dominant class to demarcate and reinforce their group’s social position (Bourdieu, 1986). For Bourdieu, social capital is defined in two parts: first, the connections or relationships that allow access to the resources held by associates within the group, and second, the amount and quality of those resources. The social network in which this functions is a dense, closed system, where the connections and collective resources possessed by the network are only available to those within the network. It is likened to an exclusive club, in which the assets and resources shared by members are represented by obligations of exchange and mutual recognition. While social in nature (favors, advice, recognition), Bourdieu asserts that this access to social capital all equates to outcomes that can be reduced to forms of economic capital. Similar to the maintenance of dominant cultural capital, this includes direct access to economic resources (subsidized loans, investment tips, protected markets), contacts with experts or individuals of

refinement, or affiliation with institutions that confer valued credentials. In this model, social capital is born from the social connections within a clearly bound, tightly-knit group and the resources conferred only to its members. While instrumental in the development of subsequent models, Bourdieu's theory of social capital is quite narrow, and not applicable to a wider relational scope. The rigid emphasis on class structure does not provide an explanation for class mobility, nor does it provide an explanation of "investments" that are not based in economic advantage (i.e. adhering to social norms). Other issues, such as the requirement for closure and density within the network and the assumption that capital is an individual rather than collective asset become key controversies in the development of later theories.

Coleman, a contemporary of Bourdieu, abandons the distinction of class divisions and focuses on the functional properties of social capital, as "not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of the individuals within the structure" (Coleman 1990, p. 302). Examples of this involve the qualities that define and develop feelings of community such as trust, validation of norms, and expectations of reciprocity. Rather than Bourdieu's fungible, explicitly economic exchanges of obligations and recognition, Coleman emphasizes the role of social capital as a collective asset that enhances the exchange of resources (Coleman, 1988). In schools, this could apply to social organizations that provide specific support to students or teachers, but also provide resources to administrators, parents, or anyone affiliated with the school. Similar to Bourdieu, this conceptualization of social capital is highly structural, requiring the network to be dense and closed. Unlike Bourdieu, however, Coleman's assertion is that network closure is not for the maintenance of social position over other classes, but to allow for the reinforcement of desired norms. The primary criticism of

Coleman's theory stems from his deviation from the concrete mechanisms of how social capital is exchanged between individuals. When divorced from the roots of capital as an individual investment, what were once clear causal mechanisms become awash with nonspecific "feelings" of community.

Putnam's (1995) work is a further extrapolation of this focus on functionality in social capital. Like Coleman, his interests are centered on the benefits of social capital as a collective asset. Addressing the work of volunteer organizations through empirical studies, Putnam asserts that participation in these groups promotes trust and collective norms that, as a shared asset, provide a shared benefit (Putnam, 1995). Although not specific in the mechanisms of how these benefits are provided, he asserts that, as products of group trust, cooperation, and participation, these benefits are specific and concrete. Deviating from both Coleman and Bourdieu's contentions that members of social networks must exist within a closed and bounded group in order to benefit from its resources, Putnam makes a strong claim that even unconnected "bystanders" may benefit from a group's collective capital. For example, pro-social norms that are supported and reinforced within a social network of students at a school confer benefits of to anyone visiting the school, even without the visitor gaining social capital through specific social interactions. Unfortunately, both Coleman and Putnam's functional view is often criticized for tautological flaws in their presentation of social capital as both resources *and* the ability to attain them. This distinction, made clear in Bourdieu's individualistic model, is obfuscated through the introduction of collective assets, and rests on the circular foundation that social capital exists when it works, but not when it doesn't. This presents difficulty in separating cause and effect, much like saying "the successful succeed,"

and steers other social capital models to draw specific distinction between individual resources, and collective assets (Carolan, 2013; Portes, 1998)

While each focusing on distinctive models of social capital, Putnam, Coleman, and Bourdieu all emphasize the importance network closure and density as key elements of a group's access to or possession of social capital. Burt (2000) challenges this assertion with his conception of *structural holes*, or the gaps within and between networks that represent valuable or strategic locations in the transfer of resources. Pushing back against Putnam and Coleman's focus on collective norms and community participation, Burt offers a more specific design for the modeling and measurement of social capital. Through occupying these structural holes, an individual gains special brokerage opportunities through which they can broker the flow of information between others in a network (Burt, 2000). Thus, social capital is not the product of membership to a group or greater connectivity, but the power granted through positional control of resources. This return to the conception social capital as an individual, capitalistic resource is, however, again limiting in applications where individuals rely on the resources accessed through a dense, closed network. In an attempt to reconcile these differences for more refined measurement of social capital, recent efforts have focused on a more integrated theory that captures the relationship between structural design and desired outcomes.

Integrated Theory

Lin (1999) proposed that neither network closure, nor structural holes are exclusively necessary for possession or access to social capital, nor should the presence of one over the other be a realistic assumption. Rather, it is in outcomes of interest that influence the structural source of capital. Lin differentiates these desired outcomes as either "preserving or maintaining resources" or "searching and obtaining resources" and are referred to as *expressive* and

instrumental actions, respectively (Lin, 1999). Expressive actions maintain and reinforce group norms through individual or collective resources. For example, an elite boarding school may benefit from a closed, dense network in reinforcing high expectations and providing peer academic support. In this case, network closure is essential in preserving high student achievement and the maintenance of local norms around work ethic and academic integrity. Instrumental actions on the other hand rely on direct conference of resources between individuals with the assumption of future reciprocity. For example, a teacher with colleagues in different schools may benefit from accumulating new curriculum or information on district policy. Here, the desired outcome is unable to be acquired through membership to the home school network, and is accessible only as a positional bridge between school networks.

Whether through expressive or instrumental actions, for the purpose of acquiring collective or individual resources, individuals engage in social interactions for the potential of positive outcomes. Regardless of the specific theoretical model, social capital theory hinges on the idea that people invest in relationships to produce profits (Lin, 1999). This investment allows access to desired resources embedded in social networks, and enhances profits (positive outcomes) to the individual through several inherently relational mechanisms (not accounted for by non-social forms of capital). Lin asserts that these mechanisms are the reasons why social relationships are able to provide positive outcomes, or in other words, why social capital works (Lin, 1999).

The first of these relational mechanisms is through facilitating the flow of information (Lin, 1999). An individual's position within the network can confer benefit by the quality or quantity of information that is provided to and/or accessed by others. In a dense network, a student's academic achievement may be contingent on access to other high achieving peers

who are able to reinforce high expectations and provide specific tutoring or assistance. In a network with structural holes, on the other hand, a student may occupy a strategic position between peer groups, brokering the exchange of information between two social circles and thus benefiting from privileged information, greater social support, and opportunities that were otherwise not available.

The second is through the exerting of influence over others that may affect the quality and character of available resources. Due to the explicit or implicit hierarchical nature of social networks certain relationships may grant influence over others who are uniquely positioned and advantaged to enhance positive outcomes (through social status, local norms, or institutional organization). Students may develop positive social relationships with teacher and staff at school because, among other things, they recognize the influence that these adult figures have in their academic outcomes. These relationships may gain access to additional support, greater leniency, or specific benefits such as letters of recommendation. Relational influence depends on a natural “asymmetry of dependence” or the idea that certain people may exert greater power to affect one’s decisions or development than others with whom they are tied.

The third of these mechanisms operates on the idea certain social ties may act as a certification of an individual’s access to resources. Referred to as social credentials, specific relationships may suggest that the individual has access to capital beyond what they normally possess. For example, a freshman in high school develops a friendship with a popular senior through playing on the same basketball team. This social tie grants the freshman greater perceived popularity amongst his peer group, access to a wider base of friends, and the guidance and protection of a developmentally mature mentor. With the younger student’s assurance that the older peer “has his back” he gains access to otherwise unavailable resources.

In turn, this assurance can produce a greater sense of connection, self-confidence, and social influence.

Finally, membership in a social group reinforces individuals' personal identity and acknowledges their access to resources. This mechanism, known as reinforcement, functions through the social validation inherent in group membership. This not only promotes an individuals' identity as good and worthy, but recognizes them as deserving or entitled to appropriate resources. A positive example of this would be membership to an extracurricular group such as a school band. A student's identity is reinforced by other band members who share similar interests, and is recognized as deserving of any benefits that are shared amongst members. A negative example of this would be membership in a gang, in which association to other gang members provides a stronger sense of identity, as well as conferring greater perceptions of safety in a dangerous neighborhood.

In his work to synthesize various theoretical models of social capital, Lin created a collaborative framework that draws on the major contributions of social capital theorists. He defines social capital as, "an investment in social relations by individuals through which they gain access to embedded resources to enhance expected returns of instrumental or expressive actions" (Lin, 2002). This definition contains common threads drawn throughout the various iterations of social capital theory, and provides a useful framework for its use in current empirical studies (Carolan, 2013). First, it attempts to capture the early economic root of social capital as an investment. While no longer for explicit economic gain, the concept of investment is shared between classical, human, cultural, and social theories of capital. Second, it specifies that through engaging in social relationships, an individual assumes a position within a social structure that grants access to desired resources embedded within that structure. For example, a

student joins an extracurricular soccer team in order to access a preferred activity, gain skills through explicit coaching and peer modeling, and form friendships that provide validation and social support. This is important because it specifies that resources such as such as positive social validation, social power, or peer mentorship are inherently relational and cannot exist independently from social structure. Finally, it asserts that through either instrumental or expressive actions, someone may seek to gain new resources (instrumental) as a result of strategic positioning, or consolidate current resources (expressive) either through an individual exchange or the pooling of collective assets. When considered together, social capital theory offers tremendous promise as a way to understand the social dynamics and influences within educational settings and potentially can inform the development of interventions and supports that promote better social relationships and a more positive school climate.

Applications to Education and Peer Ecology

When applying Lin's definition of social capital to the ecology of a school environment, it is important to examine the contextual benefits and limitations inherent in the student population, the school institution, and the expectation of positive outcomes. First, the greatest benefit in the application of social capital theory to the school environment stems from the integral social nature of the education system. For students, social investments in school relationships do not require great personal initiative to pursue, but instead are naturally fostered through the institutional design of education. Schools enable the construction of social environments through classroom units, group learning opportunities, extracurricular clubs and sports teams, and encouragement of social norms. The process of becoming educated in a school is an inherently relational experience (Osterman, 2000; Stipek, 2006). Because of this, there is overwhelming benefit for students to develop social relationships in school. Unlike an

adult work environment that may allow for independent, product-based work by a developmentally mature employee, a school environment can be incredibly challenging to navigate without possessing the resources naturally embedded in the social structure of peers, teacher, and staff. Social validation, developmental modeling, perceptions of safety, and academic support, are just a few of the many resources that are commonly embedded in the social network structure of a school.

One example of this in educational research is from Ream & Rumberger's (2008) empirical study of student dropout rates for Mexican American and nonwhite Latino students. Counter to the common hypothesis that disinterest in school leads to the development of non-school-based relationships, the results of the study indicate that school-oriented social groups encourage and promote norms associated with academic success (Ream & Rumberger, 2008). Mexican American students, as less engaged in school-related social groups and extracurricular activities, are less likely to have access to the social resources that encourage the completion of school. Although school systems naturally encourage social interaction, in this case, cultural and linguistic barriers limit the access to the embedded resources that are otherwise available to white students; thus limiting their social capital.

As a result of the social quality and character of the school system, the benefits of Lin's theory also are drawn from the measurement of social capital. The difficulty with many empirical studies on the function and form of peer ecologies in school is that they approach each student as independent source of data. They fail to account for the influence of the relational qualities that influence their thoughts, attitudes, and behaviors in a socially integrated institution (Carolan, 2013). Lin's social capital theory guides empirical work to capture relational data as a function of both students' access to embedded resources as well as their

location within a social network. This includes potential measurement of the range, quality, or diversity of resources (as examples of the quality of embedded resources), as well as an individual's specific network structure (measured through network variables such as *brokerage*, *centrality*, or *density*, as examples of the quality of the individual's location within a network) (Wasserman, 1994). In addition, by emphasizing the bridge between Burt and Coleman's theories, Lin encourages empirical work to account for both instrumental actions (in gathering new resources from an advantageous network location) and expressive actions (in consolidating individual or collective resources). In schools, this allows for further research into the study of collective norms, attitudes, and perceptions on a wide variety of issues including school climate, bullying, sense of belonging, and academic persistence and achievement (Carolan, 2013; Goodreau, Kitts, & Morris, 2009; L. Haynie, 2001a; Tilly, 2004).

One example of this is through the work of Maroulis and Gomez (2008), in their study of the effects of social relationships on academic achievement. Their work was in response to the recent ideas around improving the social context of learning through fostering peer support. They hypothesized that by increasing the "connectedness" of students' social environment, schools are able to boost academic achievement (Maroulis & Gomez, 2008). Under a social capital framework, Maroulis and Gomez (2008) utilized social network analysis in a group of 85 10th grade students to uncover the specific relational mechanisms that guided academic outcomes. Specifically, they were looking for answer to three questions: First, to what extent is academic performance "contagious" among peers? Second, after accounting for individual characteristics, is a student's location in a social network, as indicated by network density, associated with academic performance? If so, are high-density or low-density ego networks

primarily responsible for this association? Third, is there a joint effect of peer achievement and network density on academic performance?

Maroulis and Gomez (2008) sought to answer these questions through a social capital framework guided by Lin's collaborative model. In examining academic achievement, they were interested in the specific mechanisms by which an individual's social relations increased positive performance. To do this, they examined two potential sources of capital identified in Lin's model: embedded resources and network location. In this study, they defined these sources of capital as the *network composition* (the availability of relevant resources such as information, support, or positive influence), and the *network structure* (the location that one occupies within a social structure to aid in either the maintenance and consolidation of current resources, or the access to new resources). The network composition was measured through computing the "lagged peer achievement" or the mean prior achievement of his or her friends, as well as individual characteristics of the student such as socioeconomic status and prior academic performance. In this way, Maroulis and Gomez hoped to capture the resources and characteristics of the individuals embedded in each student's direct social network. The network structure was measured through network density, or the ratio of a student's relational ties to the total possible ties within the network. Their reason for this was to challenge the assumption in educational research that greater density equates to a stronger community which in turn leads to beneficial outcomes. Although this mantra is often cited by advocates of smaller school systems and classroom units, social network research that suggested greater social connectivity does not necessarily lead to positive results.

Their findings indicated that while individual measurements of network composition (lagged peer achievement) and network structure (density of ties between peers) do not

associate with student performance (GPA), they do interact to form a significant joint effect (Maroulis & Gomez, 2008). Students that are a part of dense networks of low-performing peers are found to produce the lowest levels of performance, while dense networks of high-performing peers foster the highest. This suggests that the benefits of a student's social relationships are dependent on *both* the quality of the embedded resources and the composition of the network structure. As described in the theories of social closure, a dense network will increase the consolidation of norms, attitudes and information but will not affect their quality or character. Increasing the density of the student population without attending to the desired collective resources may not produce positive results. The implications of these findings suggest that schools must focus on improving both the structure and composition of peer relationships in order to affect positive change.

Morgan and Todd (2009) also address the measurement and conceptual design of social capital as it relates to student achievement. Their empirical work sets out to reexamine the application of Coleman's original hypothesis on social capital, specifically as it relates to his assertion that intergenerational social closure promotes high school achievement (Morgan & Todd, 2009). To do this, Morgan and Todd compare academic achievement between students with dense parental networks in both public and private Catholic school sectors. By analyzing data on 10th grade students from the 2002 and 2004 waves of the Education Longitudinal Study (ELS), they sought to address the following research question: What is the relationship between parental social closure and students' math achievement and how does this relationship vary between students in Catholic and public schools?

To do this, Morgan and Todd (2009) employed a large data set from the Education Longitudinal Study that provided data on academic achievement, friendship nominations, and

whether their parents knew the parents of the nominated friends. Their analysis included measurements at the individual and whole-school level in order to capture individual and collective examples of social capital. Through their results, Morgan and Todd found a positive association between the degree of parental social closure in Catholic schools and individual student math achievement. In addition, although parental social closure may be effective in Catholic school communities, it was found to be ineffective in promoting achievement in public school communities. It is theorized that the Catholic school families maintain a similar set of normative values (reinforced by the Church) while public school families do not possess a similarly common set of values.

In this empirical extension of social capital theory, Morgan and Todd (2009) seek to address a similar theoretical burr uncovered in the work of Maroulis and Gomez (2008). In this case, it is problematic to assume the interdependence of the network structure from the character of the embedded resources. In the case of Catholic versus public schools, it is clear that parental social closure alone is not sufficient to produce increased achievement. The norms and values shared between like-minded parents, in this case from a common faith, provide a consistent platform for reinforcing the behaviors of their children. Although reached through different research questions and analytics, Maroulis and Gomez revealed similar theoretical findings in their work with friendship networks and peer achievement: a dense network of friends will promote and reinforce academic norms, regardless of whether they are associate with high or low achievement. In these studies, social capital arises from both the social structure of the school and the characteristics of the resources embedded within that structure.

Limitations of Prior Research

Due to the fact that the perception of school climate is highly intertwined with the social ecology of the school environment, the quality and character of student relationships play a large role in any associated outcomes. For this reason, research suggests that by improving the quality of relationships between peers, schools create an environment that supports learning, protects against risky behaviors, and fosters a sense of belonging with the institution (Cohen et al., 2009; Fan et al., 2011).

The advantage utilizing of social networks and a relational perspective in studying school climate is captured in Add Health's network data codebook, "Social networks are a direct link between individuals and the social structure in which they are embedded; for adolescents, networks of peers and friends are one of the most important social contexts" (Add Health, 2008). Up until this point, research has either captured and analyzed individual student attributes in the measurement of school climate (Cohen et al., 2009), or performed network analysis on how individual dimensions of climate are associated with social network structure (Daly, 2010; L. Haynie, 2001a). Although many studies are employing a peripherally relational approach, research has not attempted to capture a broader picture of students' perception of climate in the context of complete school networks.

Integrated Network Model of School Climate

The institution of school in its modern form exists within a rich social context. As such, a student's perception of the school climate is influenced not only by the experience of interpersonal, environmental, and cultural influences, but also by the patterns of the complex social structure within which they are embedded. This research draws on the primary assumption

that school climate cannot be divorced from the school's social contextual patterns and as such, must be conceptualized through a representative model.

Drawing from early social networking literature, the theory of social capital creates a conceptual division between the patterns of relationships within a social network (network structure) and the attributes or resources that comprise social constructs (network composition). Until recently, the primary focus of climate research has focused solely on the composition of school climate, or how specific attributes contribute to a greater perception of climate. As a result, the conceptual model for this study necessitates an application of prior climate models into a Network Theory framework. Adopting a network perspective allows for the integration of structural-contextual factors with traditional attribute-focused climate models. Under a primary assumption of network theory, that the patterns of social relationships (network structure) provide essential information in the conceptualization of social variables, this revision supports a clear and necessary inclusion of structural measurement to climate models. As prior climate research does not address this fundamental need for network structure, this study will utilize an Integrated Network Model of School Climate (see Figure 1) in order to integrate the traditional composition of climate theory with structural components of network theory.

The Integrated Network Model of School Climate conceptualizes school climate through the interaction of three constructs. The first is the *Network Composition of Climate*, or the individual component attributes of interpersonal, environmental, cultural, and ecological influences that contribute to how a student perceives his experience at school. These components include perceptions of positive peer relationships, school safety, racial climate, student-teacher interaction, and many others that have been the primary focus of contemporary school climate research. The second is the *School Network Structure*, or the patterns of relationships that

comprise the social structure of the student body. This can be described through a myriad of social networking variables or complex social network models, and allow research to examine climate through broader school-wide context. This model suggests that measures such as density, mutuality, and salience help to describe complex social patterns that influence, and are influenced by, students' perception of climate at a school level. The third is the *School-Wide Perception of Climate*, or the holistic perception of a students' school experience. This construct is the aggregate climate rating of all students within a single school, representing individual student perceptions in the context of a complete school community.

As social constructs within an inherently social institution, this model assumes that any changes to composition, structure, or perceived experience would precipitate social-contextual changes to the rest of the system. As a result, the model is transactional, and accounts for the influence that each construct will have on the others. Specifically, the research questions of this study will examine the interaction between the School Network Structure and the School-Wide Perception of Climate (see Figure 2) in order to address the limited inclusion of network methodology in current school climate research.

It is important to note that the inclusion of social structure variables to school climate models is not a new idea. Within most climate models, such as Tagiuri's (1968) popular conceptual model, researchers have accepted social structure as a major component of school climate. However, while social structure is acknowledged, contemporary models still approach this variable from a traditional "actor-by-attribute" methodology, and do not apply a contextual perspective in the application of these attributes as they are embedded within the greater social network. With the application of network theory however, research may include variables of social structure to examine relational patterns within the context of the entire network. This

means accounting for social relationships not merely as the attributes of individuals within the structure, but as characteristics of the structure itself. This re-envisioning of school climate models allows for the integration of traditional climate composition and structural network variables in order to gain a holistic understanding of school climate at a school level.

Purpose of the Proposed Study

In the school environment, peers may serve as agents that are not only more developmentally accessible, but more socially influential than adult relationships (Harris, 1998). The theory of group socialization suggests that the environmental context will have great effect in determining the primary social influence. In schools, adult mentors, while perceived as wiser and mature, behave within a different set of attitudes, beliefs, and expectations. While this “adult world” is effective for establishing the didactic relationship of teacher-student and does not exclude the adult from their role as a social model, it does, however, naturally form a contextual social boundary (Harris, 1998). As a result, it is theorized that for youth, the developmental inaccessibility of the “adult world” exerts less influence than peers in affecting outcomes such as beliefs, values, attitudes, and risk-taking behaviors. Peers, on the other hand, share beliefs and values which are contextualized as a socially developmental progression, and idealized as within-group models (Rhodes, Grossman, & Resch, 2000). Indeed, peer relationships appear to exert proximal, potent effects on student adjustment and wellbeing, particularly as students progress into early and late adolescence (Yibing, Doyle, Calvin, Jianjun., & Lerner, 2011).

As a student’s perception of school climate, represented by their holistic impression and relationship with the institution of school, is so greatly dependent on the social context within which they are embedded, it is imperative to understand and explain the effect of network structure at the school level. In response to this need, the purpose of this study is to

explore the ways in which the structure of students' social relationships at a school level is associated with their school-wide student perceptions of school climate. The methodology utilizes analyses to best fit the Integrated Network Model of School Climate, in which climate is hypothesized to exist as a perception of aggregate social experiences. This allows for an important initial understanding of the relationship between social network variables and school climate at a school-wide level of analysis. To accomplish this, three research questions were formulated, and data from an extant dataset from a large-scale longitudinal study were used to systematically address each of them.

Research Questions

The proposed study will investigate the following questions:

- 1) Which school network structure variables (represented by density, size, mutuality, and salience of grade, race, and gender) appear to be most predictive of the school-wide student perception of school climate?
- 2) To what extent does school climate predict school network structure variables (represented by density, mutuality, and salience of grade, race, and gender) above and beyond the effects of other confounding variables (socioeconomic status, racial diversity, achievement)?
- 3) How does the size of a school moderate the relationship between specific aggregate school variables (as represented by racial diversity, grade salience, and race salience) and school-wide student perception of school climate?

The following are the proposed hypotheses for the research questions:

- 1) School size and grade salience will be most predictive of the school-wide perception of school climate, as these variables are the most representative of the

physical and institutional social boundaries of the school. Larger schools will be predictive of lower school climate, as suggested by McNeeley et al. (2002), due to a decreased sense of belonging and connection to the greater school community. Grade salience will be positively associated with increased perceptions of climate, as grade levels provide an institutional construct for sub-communities within the school and provide a proxy for the overall perception of school climate at the grade-level. Race salience will be negatively associated with positive school climate, as racial divisions create perceptions of exclusionary social schisms within the student body and lead to decreased feelings of acceptance and belonging to the greater institution. Mutuality will have a slight positive association, as it is reflective of reciprocal, stable friendships within the school community. Density will also have a small positive association with positive perceptions of school climate, as it has been demonstrated that school networks may gain benefits to varying degrees of network density. School networks with high density, for example, may benefit from access to shared group norms, behaviors, and expectations (Coleman, 1988). Gender salience will not significantly predict school climate.

- 2) It is hypothesized that school climate will predict school network structure variables in an interactional manner, revealing similar relationships above and beyond the effects of the confounding variables of socioeconomic status, racial diversity and achievement. As such, school climate will be predictive of a strong positive association with grade salience and a strong negative association with race salience. School climate will have a small positive

association with density and mutuality, and no significant association with gender salience.

- 3) It is hypothesized that there will be significant interaction effects in the relationship between aggregate school variables and school climate, moderated by school size. Most significantly there will be an interaction with racial diversity as Howley et al. (2000) has suggested a significant effect in the relationship between affluent communities and school size.

Chapter III: Methods

Add Health Dataset

Extant data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) was used for this study. As is evidenced by Haynie's (2001) research on delinquency, some of the most salient data for analysis on school social networks comes from Add Health. The first wave of the Add health survey collected data by means of an in-school questionnaire from 90,118 adolescent students in grades 7-12, nested within 144 randomly selected schools around the United States (Carolan, 2013). Administered between September 1994 and April 1994, the survey gathered information on questions regarding social and demographic characteristics, education and occupation of parents, household structure, risk behaviors, expectations for the future, self-esteem, health status, friendship, attitudes about school, and extracurricular activities. Additionally the student respondents also provided nominations for their five best male friends and five best female friends from a school roster. Through these friendship nominations within each school, the quality and character of the school social network can be constructed and analyzed.

The existence of the school social networks variables within the Add Health data is unique and addresses some one of the major limitations in the study of the adolescent health: the social-contextual nature of school. Through common sampling designs that draw randomized students from their school, traditional research assumes the independence of these responses from the social context of the school environment. Unlike these large-scale demographic surveys, the Add Health data set provides information from a clustered design to allow measurement of social networks at both an individual and school level. The design of this sample, in conjunction with not only the interview survey of adolescents but also the

nomination of friendships, allows for the construction of school networks and their association to student attitudes, perceptions, and behaviors and aggregation of data to the school-level. As a result, through its application to the Integrated Network Model of School Climate, it allows climate and social structure to be addressed at a school-wide level of analysis.

As a stated aim of the Add Health study is to “carefully measure the major social contexts affecting the health and well-being of adolescents,” it provides social network data to better understand how individual students are linked to the social structures in which they are embedded (Add Health, 2008). As this data has been gathered from complete school networks, social networks can be constructed to understand both egocentric friendship networks of individual students as well as describe the structural qualities of the entire school. In conjunction with attribute data from the in-school surveys, the construction of these network variables allows for better understanding of the health and behavior of adolescent students and the specific qualities of the social network in which they are embedded. Due to the massive breadth of the Add Health dataset, it has been applied to a wide range of network studies in the fields of sociology (L. Haynie, 2001a), education (Ream & Rumberger, 2008), health (Price, Risk, Wong, & Klinge, 2002), and most recently, studies on the quality and composition of student networks themselves (Goodreau et al., 2009).

Participants

A sample of schools from the US was selected with unequal probability of selection. Incorporating systematic sampling methods and implicit stratification into the Add Health study design ensured this sample is representative of US schools with respect to region of country, urbanicity, school size, school type, and ethnicity (Add Health, 2003). This was a stratified,

random sample of all high schools in the United States. A school was eligible for the sample if it included an 11th grade and had a minimum enrollment of 30 students. A feeder school, a school that sent graduates to the high school and that included a 7th grade, was also recruited from the community (Harris, et al., 2009). Of the original 144 schools (90,118 students), 15 schools did not provide sufficient friendship nomination data to create complete social networks (response rates of 50% or higher) and were excluded from the study. The remaining 128 schools included 75,871 students, and included data from 89.9% public schools and 10.1% private schools. Of those 128 schools, only 91 schools provided sufficient demographic data (racial diversity, family income, and academic student achievement) to address the second research question. For more school demographic information, see Table 1.

Measures

School Climate. Within the Add Health Wave I data collection, a 45-minute in-school survey was administered between September 1994 and April 1995 to the sample of 90,118 students across all 144 sampled schools. The Protective Factors and Academics sections of the survey included seven items used to measure student perceptions of school climate. Sample items included, “I feel safe in my school” and “I feel close to people at this school.” Students responded to items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), and the mean of these scores was used to represent the student’s rating of school climate. For the measure of school-wide perceptions of climate, these ratings will be averaged into an aggregate mean for each school. These items have been developed as a valid measure of a student’s perception of climate through use in prior Add Health climate studies (Brookmeyer, Fanti, & Henrich, 2006; Loukas et al., 2006; Resnick MD et al., 1997), and have been found to be internally consistent with a Cronbach’s alpha between .73 and .75.

Additionally, Kohl et al., (2013) cites these items as a successful example of an adapted scale in his review of school climate assessments.

Network Variables. As a part of the in-school questionnaire, students were given a copy of a roster listing every student in the school, as well as a roster of one “sister” school. The survey asked the students to list their closest male and female friends separately, up to a maximum of five male and five female friends. Friendship nominations from the same school network were compiled to create complete social networks for all schools with a completion rate of over 50% (129 Schools). Students were allowed to list friends who did not attend the one of the two school options by using a specific code. This code was used for any student who attended either school but was not on the roster, or did not attend either school. Out-of-school nominations as well as sister school nominations were not included in the composition of individual school networks. From these 129 schools, network variables have been constructed at complete network levels for measures of density, mutuality, and salience of grade, race, and sex within the Network Variables Dataset. These Add Health network variables have been employed in a wide range of previous studies, linking school network structure to outcomes such as delinquency, racial climate, and substance use (Fujimoto & Valente, 2012; Kao & Vaquera, 2006; L. Haynie, 2001a).

Density. Density is a network variable that is defined by the number of ties within a network, divided by the total number of possible ties. See Figure 3 for a simple example of network density. As a common structural measure of a complete network, density is often representative of the inherent interconnection of a community (Atteberry & Bryk, 2010). For adolescent friendships within a school network, this measurement can be equated with the degree that students know and interact with other students at school. As such, it is

hypothesized that density helps explain the way that information or resources are shared within a network. Measurements of density have been calculated for all complete school networks through the Add Health Network Variables Dataset with the following equation:

$$DENSITY = \frac{\Sigma X}{(g(g-1))}$$

X = total friendship network
g = number of nodes in **X**

Mutuality. Mutuality is a network variable that describes the probability with which individuals reciprocate friendship nominations. The follow calculation has been performed through the Add Health Network Data for complete school networks based on Katz and Powell's (1955) Mutuality index:

$$MUTUALITY = \frac{2(g-1)^2 M - L^2 + L_2}{L(g-1)^2 - L^2 + L_2}$$

g = number of nodes in the total friendship network **X**
M = number of mutual dyads
L = sum of the out-degree of the total friendship network **X**
L₂ = sum of the squares of the out-degree of the total friendship network **X**

Mutuality is explained in network theory as a measure of describing the symmetry of power between dyads as they are embedded within a larger network. Students who reciprocate friendship nominations are more likely to form deeper, more meaningful relationships based on a mutual exchange of trust, social support, and physical resources (Wasserman & Faust, 1995). Mutuality is an important element to early childhood attachment, and extends into adolescence as a major factor in the development of peer relationships (Schaefer, 2010). For an example of mutuality in a directed network, see Figure 4.

Saliency. Saliency is a network variable that describes the frequency with which ties exist between individuals who share a specific attribute. Within the network variables dataset, saliency measures for attributes of grade, race, and gender have been calculated for complete school networks through the following equation:

$$SALIENCY_k = \frac{t_{kk} / T_k}{g_k / g}$$

k = relevant trait

t_{kk} = number of ties sent by those with trait k to those with trait k

T_k = total number of ties sent by those with trait k

g_k = number of nodes of those with trait k

g = number of nodes in the network

Saliency provides a valuable perspective into how student friendships share both individual attributes (e.g. race and gender) as well as structural attributes (e.g. grade) within the school environment. See Figure 5 for an example of network saliency.

Size. Roster size is defined by the total number of students enrolled in each school, and is supplied in both the Network Variables and School Information datasets. This variable is one of the most basic descriptive building blocks of school network structure, and helps to define the natural physical boundaries of each social network. While roster size does not offer any information about the latent structural patterns, its effects on school climate has been under ongoing scrutiny (Thapa, Cohen, Guffey, & Higgins-D'Alessandro, 2013b). It is important to note that unlike density, mutuality, and saliency measures, roster size can be conceptualized as a physical attribute of the school as well as a measure of network structure. Theoretically this places school size in the category of both Network Structure and Network Composition and offers valuable information in the potential interactions between traditional network variables and school climate.

Control Variables. During the Add Health Wave I data collection, additional school demographics were collected through family, administrator, and school information questionnaires. Socioeconomic status, racial diversity, and achievement are commonly addressed in prior research as key elements to the school-wide composition of school climate (Kohl, Recchia, & Steffgen, 2013; McNeely et al., 2002; Thapa et al., 2013b). They have been included as control variables to understand the unique contribution of social network variables above and beyond the demographic attributes of the student body. Socioeconomic status, racial diversity, and student achievement were calculated to represent these school-wide demographics.

Family Income - Socioeconomic Status. A school-wide measure of SES was calculated through the median income reported by families in the in-home family questionnaire for each school. This measurement of general school SES has been compared in median and variance with the 1994 US Census data to ensure external validity

Racial Diversity. A school-wide measure of racial diversity will be represented by the percentage of non-white students enrolled in each school. Calculations for this measure will be drawn from self-reported racial identity within the in-school questionnaire. This measure is derived through the same methods employed in the Network Variable data, and will exclude all students who report their racial identity as white only (no other item responses), and non-Latino.

Achievement. A school-wide measure of achievement will be calculated from the percentage of students at each school who score at or above grade-level in state standardized testing as reported by school administrators on the school administrator questionnaire.

Data Analytic Plan

In order to address the research questions, statistical analysis was employed using multiple regression techniques in SPSS. Descriptive and inferential statistics were calculated in order to address the underlying research questions guiding this study. Specifically descriptive statistics in the form of means, standard deviations, range, frequencies, skew and kurtosis were calculated. Results were examined to ensure data met assumptions and lack of extreme outliers. Skew and kurtosis were examined to examine the normality of variables. A correlation matrix was calculated to examine variables for high degrees of correlation. Standard and sequential predictor entry linear regressions were run to determine the transactional effects of school climate on network variables and vice versa. Estimates of the contribution of individual variables were examined through the squared semi-partial correlations and their respective significance values. In each regression model, residuals, p-plots, and the sampling design were examined to address the assumptions of linearity, normality, homoscedasticity, and independence.

Question 1. In order to determine which school network structure variables appear to be most predictive of the school-wide perception of school climate, standard predictor entry linear regression was run to determine the amount of unique variance contributed by social network variable predictors (density, roster size, mutuality, and salience of grade, race and sex) to the aggregate school-wide rating of school climate (n=127). All predictor variables were standardized prior to analysis to aid in interpretation. Correlation tables were checked for issues of multi-collinearity, and assumptions of normality, linearity, homoscedasticity were checked via residual graphs and p-plots.

Question 2. In order to determine the extent to which school climate predicts school network structure variables above and beyond the effects of other confounding variables, six separate sequential predictor entry linear regressions were run to determine the unique variance contributed by school climate to each network variable after accounting for the variance of theoretically confounding variables (SES, diversity, and achievement) (n=91). All predictor variables were standardized prior to analysis to aid in interpretation. In addition, all *p*-values were corrected via Bonferroni method to adjust for inflated type I error rate in multiple models. Correlation tables were checked for issues of multi-collinearity, and assumptions of normality, linearity, homoscedasticity were checked via residual graphs and p-plots.

Question 3. In order to determine the extent to which school size moderate the relationship between aggregate school variables and school climate, interaction terms were created by multiplying the pairs of standardized predictors and checked via preliminary regression to determine the possibility of an interaction effect. The proposed variables were used to calculate the \hat{y} outcomes at -1SD, mean, and +1SD for both predictors. These values were graphed in excel to visualize interaction effects.

Chapter IV: Results

School Climate Outcomes

Research Question 1: Which school network structure variables (represented by density, size, mutuality, and salience of grade, race and sex) appear to be most predictive of the school-wide perception of school climate?

Descriptive Statistics. Descriptive statistics and zero-order correlations were calculated for the aggregate outcome measure of school climate as well as each of the social network variable coefficients, see Table 2. One school was excluded via listwise deletion from the original sample of 128 schools, due to its single-gender student enrollment yielding no meaningful gender salience data. Of the remaining 127 schools, the mean aggregate school climate rating was 3.52 points, with a standard deviation of 0.19 points. The mean school roster size of this sample was 794.86 students with a standard deviation of 618.05. Due to the necessity of a school's roster size to be positive, it is not surprising that this distribution is positively skewed and reveals some non-normality to the data. Regardless, this departure from normality is minor, and due to a sufficient sample size will have no significant effect on the outcome of the linear regression. The mean school network density was 0.43 with a standard deviation of 0.11, while mean mutuality was 0.38 with a standard deviation of 0.05. The mean network salience of grade, race and gender were 0.71, 0.24, and 0.20 with standard deviations of 0.13, 0.19, and 0.07 respectively. There were significant zero-order correlations between the aggregate school climate outcome and every network variable predictor except mutuality. Network density shared significant predictor-predictor correlations with each of the other network variables except grade salience. While there is some multi-collinearity between the network variable predictors, no correlations exceeds $\pm .4$ with the exception of a correlation of .61 between gender salience and

grade salience. Some correlation is expected between variables that describe a network structure, however, are not high enough to warrant major concern (Wasserman, 1994).

Model Results. The set of predictors (density, mutuality, grade salience, race salience, gender salience, and roster size) accounted for a significant amount of variance in aggregate school climate, $R^2 = 0.35$, $F(6,120) = 10.86$, $p < .001$, $R^2_{\text{adjusted}} = 0.32$, see Table 5. The model estimate of the intercept showed that schools with an average density, mutuality, grade salience, race salience, gender salience, and roster size were predicted to average 3.52 points ($SE = .01$) on the aggregate school climate score, which was significantly different from zero, $t(120) = 250.02$, $p < .001$. Density had a unique positive effect on school climate ($b = 0.04$, $beta = 0.19$, $SE = 0.02$), $t(120) = 2.10$, $p = .038$, $sr^2 = 0.02$. Specifically, there is an estimated mean increase of .04 points on school climate rating for each standard deviation increase of friendship network density, holding all other variables constant. Race Salience had a unique negative effect on school climate ($b = -0.05$, $beta = -0.25$, $SE = 0.02$), $t(120) = -3.17$, $p = .002$, $sr^2 = 0.05$. In other words, there is an estimated mean decrease of .05 points on school climate rating for each standard deviation increase of race salience (a measure of whether students will nominate friends of a similar race), holding all other variables constant. Roster size also had a unique negative effect on school climate ($b = -.06$, $beta = -0.29$, $SE = .02$), $t(120) = -3.65$, $p < .001$, $sr^2 = 0.07$. Specifically, there is an estimated mean decrease of .06 points on school climate rating for each standard deviation increase in the number of students attending the school, holding all other variables constant. The other network variable predictors, on the other hand, were not uniquely predictive of school climate. This includes mutuality ($b = 0.01$, $SE = 0.02$), $t(120) = .75$, $p = .454$, grade salience ($b = 0.03$, $SE = 0.02$), $t(120) = 1.85$, $p = .067$, and gender salience ($b = 0.02$, $SE = 0.02$), $t(120) = 1.02$, $p = .310$.

Network Variable Outcomes

Research Question 2: To what extent does school climate predict school network structure variables (represented by density, mutuality, and salience of grade, race and gender) above and beyond the effects of other confounding variables (family income, racial diversity, achievement)?

Descriptive Statistics. Descriptive statistics and zero-order correlations were calculated for the network variable outcomes, the demographic control variables (family income, diversity, and achievement), and the aggregate school climate coefficient, see Table 3. Of the 128 schools from the sample, 37 schools were excluded via listwise deletion due to a lack of demographic data, leaving a sample of 91 schools to address the second research question. Listwise deletion was selected as the preferred method of addressing the missing data for several reasons. First, as there are no indications of missingness patterns that are a function of the outcome variables, listwise deletion produces unbiased regression slope estimates. Second, while a reduced sample size lowers overall statistical power, the sample of $n = 91$ is still within a sufficient n -to- p ratio to minimize type-II error rate. Third, while not taking full advantage of all available data, listwise deletion avoids the problems of bias and inaccurate variance that occur with imputation methods such as mean substitution or dummy variable adjustment. Finally, despite a reduction in sample size of 28% ($n = 127$ to $n = 91$) from the analysis of the first model, the means and standard deviations of school climate and network variables remain highly consistent.

The mean family income was 35.69 thousand dollars, with a standard deviation of 13.01 thousand dollars across all schools in the sample. The mean student diversity was 55.43 percent non-white students, with a standard deviation of 26.24 percent. The mean academic achievement was 78.62 students performing at or above grade level on standardized state testing, with a

standard deviation of 14.10 percent. There was little to no change in means and standard deviations of school climate and network variables from those calculated in first model. Family income, diversity, and achievement shared significant zero-order correlations with density (0.16, -0.59, and 0.22 respectively) and mutuality (0.34, -0.59, and 0.32 respectively), while also sharing significant correlations with each other. There were no significant correlations between school climate and family income, diversity, or achievement.

Model Results for Roster Size. A multiple linear regression with sequential predictor entry was used to predict school roster size. All p -values have been adjusted to account for type-I error inflation through analysis of multiple models. Family income, diversity, and achievement were entered into the model predicting roster size first, with zero-order correlations of $r = 0.11$, $r = 0.17$, and $r = -0.04$, respectively, and they accounted for 7% of the variance in roster size, $F(3, 88) = 2.35$, $p = .468$, $R^2_{\text{adjusted}} = 0.04$, see Table 6. School climate was entered into the model next, and with a zero-order correlation of $r = -0.38$, accounted for a significant unique variation in roster size after accounting for family income, diversity, and achievement, $R^2_{\text{change}} = 0.14$, $F_{\text{change}}(4, 87) = 14.86$, $p < .001$.

Results from the final block, with all predictors entered into the model, showed that the mean estimate of roster size was 814.96 ($SE = 63.23$) across all schools in the sample with an average family income, diversity percentage, level of achievement, and school climate which was significantly greater than zero, $t(87) = 12.89$, $p < .001$. School climate had a unique negative effect on roster size ($b = -254.08$, $\beta = -0.38$, $SE = 65.91$, $t(87) = -3.86$, $p < .001$, $sr^2 = 0.14$). Specifically, there was an estimated mean decrease of 254.08 students for every one standard deviation increase of school climate rating, when holding the variance attributable to all other variables in the model constant. Family income also accounted for a significant unique positive

effect on roster size ($b = 235.93$, $\beta = 0.32$, $SE = 86.00$, $t(87) = 2.74$, $p = .042$, $sr^2 = 0.07$).

Specifically, there is an estimated mean increase of 253.93 students for every one standard deviation increase of school-wide median family income, holding all other variables constant.

Diversity ($b = 122.74$, $SE = 69.26$), $t(87) = 1.77$, $p = .240$, and achievement ($b = -55.87$, $SE = 74.46$), $t(87) = -0.75$, $p > .999$, on the other hand, were not uniquely predictive of school roster size.

Model Results for Density. A multiple linear regression with sequential predictor entry was used to predict school network density. All p -values have been adjusted to account for type-I error inflation through analysis of multiple models. Family income, diversity, and achievement were entered into the model predicting density first, with zero-order correlations of $r = 0.16$, $r = -0.59$, and $r = 0.22$, respectively, and they accounted for 33% of the variance in density, $F(3, 88) = 14.21$, $p < .001$, $R^2_{\text{adjusted}} = 0.30$, see Table 7. School climate was entered into the model next, and with a zero-order correlation of $r = 0.18$, and did not account for a significant unique variation in density after accounting for family income, diversity, and achievement, $R^2_{\text{change}} = 0.01$, $F_{\text{change}}(4, 87) = 1.00$, $p > .999$.

Results from the final block, with all predictors entered into the model, showed that the mean estimate of density was 0.44 ($SE = 0.01$) across all schools in the sample with an average family income, diversity percentage, level of achievement, and school climate which is significantly greater than zero, $t(87) = 46.13$, $p < .001$. Diversity accounted for a significant unique negative effect on density ($b = -.06$, $\beta = -0.60$, $SE = 0.01$, $t(87) = -5.95$, $p < .001$, $sr^2 = 0.27$). In other words, there is an estimated mean decrease of 0.06 network density or 0.6 standard deviations of density for every one standard deviation increase of the schools' student diversity percentage, holding all other variables constant. Family income ($b = -0.21$, $SE = 0.01$), $t(87) = -$

1.60, $p = .678$, achievement ($b = 0.00$, $SE = 0.01$), $t(87) = 0.21$, $p > .999$, and school climate ($b = 0.01$, $SE = 0.01$), $t(87) = 1.00$, $p > .999$, on the other hand, were not uniquely predictive of school network density.

Model Results for Mutuality. A multiple linear regression with sequential predictor entry was used to predict school network mutuality. All p -values have been adjusted to account for type-I error inflation through analysis of multiple models. Family income, diversity, and achievement were entered into the model predicting mutuality first: with zero-order correlations of $r = 0.34$, $r = -0.59$, and $r = 0.11$ respectively they accounted for 38% of the variance in mutuality, $F(3, 88) = 17.64$, $p < .001$, $R^2_{\text{adjusted}} = 0.35$, see Table 8. School climate was entered into the model next, and with a zero-order correlation of $r = 0.13$, and did not account for a significant unique variation in mutuality after accounting for family income, diversity, and achievement, $R^2_{\text{change}} = 0.00$, $F_{\text{change}}(4, 87) = 0.30$, $p > .999$.

Results from the final block, with all predictors entered into the model, showed that the mean estimate of mutuality was 0.38 ($SE = 0.01$) across all schools in the sample with an average family income, diversity percentage, level of achievement, and school climate, which is significantly greater than zero, $t(87) = 85.16$, $p < .001$. Diversity accounted for a significant unique negative effect on mutuality ($b = -0.03$, $beta = -0.52$, $SE = 0.01$, $t(87) = -5.30$, $p < .001$, $sr^2 = 0.20$). In other words, there is an estimated mean decrease of .03 network mutuality or .52 standard deviations of mutuality for every one standard deviation increase of the schools' student diversity percentage, holding all other variables constant. Family income ($b = 0.01$, $SE = 0.01$), $t(87) = 1.04$, $p > .999$, achievement ($b = 0.01$, $SE = 0.01$), $t(87) = 0.62$, $p > .999$, and school climate ($b = 0.01$, $SE = 0.01$), $t(87) = 0.55$, $p > .999$, on the other hand, were not uniquely predictive of school network mutuality.

Model Results for Grade Salience. A multiple linear regression with sequential predictor entry was used to predict school network grade salience. All p -values have been adjusted to account for type-I error inflation through analysis of multiple models. Family income, diversity, and achievement were entered into the model predicting grade salience first: with zero-order correlations of $r = 0.22$, $r = 0.11$, and $r = 0.11$ respectively they accounted for 11% of the variance in grade salience, $F(3, 88) = 3.62$, $p = .096$, $R^2_{\text{adjusted}} = 0.08$, see Table 9. School climate was entered into the model next, and with a zero-order correlation of $r = 0.36$, and accounted for a significant 14% of unique variation in grade salience after accounting for family income, diversity, and achievement, $R^2_{\text{change}} = 0.14$, $F_{\text{change}}(4, 87) = 15.49$, $p < .001$

Results from the final block, with all predictors entered into the model, showed that the mean estimate of grade salience was 0.72 ($SE = 0.01$) across all schools in the sample with an average family income, diversity percentage, level of achievement, and school climate, which is significantly greater than zero, $t(87) = 60.64$, $p < .001$. School climate accounted for a significant unique positive effect on grade salience ($b = 0.05$, $beta = 0.38$, $SE = 0.01$, $t(87) = 3.94$, $p < .001$, $sr^2 = 0.13$). In other words, there is an estimated mean increase of .05 network grade salience or .38 standard deviations of grade salience for every one standard deviation increase of the schools' student school climate rating, holding all other variables constant. Diversity also accounted for a significant unique positive effect on grade salience ($b = 0.04$, $beta = 0.31$, $SE = 0.01$, $t(87) = 2.87$, $p = .030$, $sr^2 = 0.07$). In other words, there is an estimated mean increase of .04 network grade salience or .31 standard deviation of grade salience for every one standard deviation increase of the schools' student diversity percentage, holding all other variables constant. Family income ($b = 0.04$, $SE = 0.02$), $t(87) = 2.32$, $p = .138$, and achievement ($b = 0.02$,

$SE = 0.01$), $t(87) = 1.06$, $p > .999$, on the other hand, were not uniquely predictive of school network grade salience.

Model Results for Race Salience. A multiple linear regression with sequential predictor entry was used to predict school network race salience. All p -values have been adjusted to account for type-I error inflation through analysis of multiple models. Family income, diversity, and achievement were entered into the model predicting race salience first: with zero-order correlations of $r = -0.18$, $r = 0.21$, and $r = -0.15$ respectively they accounted for 6% of the variance in race salience, $F(3, 88) = 1.84$, $p = .876$, $R^2_{\text{adjusted}} = 0.03$, see Table 10. School climate was entered into the model next, and with a zero-order correlation of $r = -0.33$, and accounted for a significant 9% unique variation in race salience after accounting for family income, diversity, and achievement, $R^2_{\text{change}} = 0.09$, $F_{\text{change}}(4, 87) = 9.21$, $p = .018$.

Results from the final block, with all predictors entered into the model, showed that the mean estimate of race salience was 0.24 ($SE = 0.02$) across all schools in the sample with an average family income, diversity percentage, level of achievement, and school climate, which is significantly greater than zero, $t(87) = 12.64$, $p < .001$. School climate accounted for a significant unique negative effect on race salience ($b = -0.6$, $beta = -0.31$, $SE = 0.02$, $t(87) = -3.04$, $p = .018$, $sr^2 = 0.09$). In other words, there is an estimated mean decrease of .06 network race salience or .31 standard deviations of race salience for every one standard deviation increase of the schools' student climate rating, holding all other variables constant. Family income ($b = -0.01$, $SE = 0.03$), $t(87) = -.44$, $p > .999$, achievement ($b = -0.01$, $SE = 0.02$), $t(87) = -0.64$, $p > .999$, and diversity ($b = 0.02$, $SE = 0.02$), $t(87) = 0.98$, $p > .999$, on the other hand, were not uniquely predictive of school network race salience.

Model Results for Gender Salience. A multiple linear regression with sequential predictor entry was used to predict school network gender salience. All p -values have been adjusted to account for type-I error inflation through analysis of multiple models. Family income, diversity, and achievement were entered into the model predicting gender salience first: with zero-order correlations of $r = -0.06$, $r = 0.37$, and $r = -0.09$ respectively they accounted for 15% of the variance in mutuality, $F(3, 88) = 5.19$, $p = .012$, $R^2_{\text{adjusted}} = 0.12$, see Table 11. School climate was entered into the model next, and with a zero-order correlation of $r = 0.12$, and did not account for a significant unique variation in mutuality after accounting for family income, diversity, and achievement, $R^2_{\text{change}} = 0.03$, $F_{\text{change}}(4, 87) = 3.24$, $p = .450$

Results from the final block, with all predictors entered into the model, showed that the mean estimate of gender salience was 0.20 ($SE = 0.01$) across all schools in the sample with an average family income, diversity percentage, level of achievement, and school climate, which is significantly greater than zero, $t(87) = 27.95$, $p < .001$. Diversity accounted for a significant unique positive effect on gender salience ($b = 0.03$, $beta = 0.46$, $SE = 0.01$, $t(87) = 4.08$, $p < .001$, $sr^2 = 0.16$). In other words, there is an estimated mean increase of .03 network gender salience or .46 standard deviations of gender salience for every one standard deviation increase of the schools' student diversity percentage, holding all other variables constant. Family income ($b = 0.01$, $SE = 0.01$), $t(87) = 0.64$, $p > .999$, achievement ($b = 0.01$, $SE = 0.01$), $t(87) = 0.53$, $p > .999$, and school climate ($b = 0.01$, $SE = 0.01$), $t(87) = 1.80$, $p = .450$, on the other hand, were not uniquely predictive of school network gender salience.

Interaction Terms

Research Question 3: How does the size of a school moderate the relationship between specific aggregate school variables (as represented by racial diversity, salience of grade, and salience of race) and its school-wide perception of school climate?

Descriptive Statistics. Descriptive statistics and zero-order correlations were calculated for all aggregate school variables and calculated interaction terms, see Table 4. Means and standard deviations of school climate and network variables were identical to those calculated in the first model, while the mean student diversity was 51.81 percent non-white students with a standard deviation of 25.19 percent. As expected from the first model, there were significant zero-order correlations between school climate and all three school network variables, but not with student diversity. While there are significant correlations within and between interaction terms, these are not meaningful due to their shared origin as products of the other coefficients.

A multiple linear regression with sequential predictor entry was used to predict aggregate school climate rating, and the potential interaction effects of school roster size. Results showed that the main effects of roster size, diversity, race salience, and grade salience, which comprised the first block, accounted for significant variation in the outcome, $R^2 = 0.32$, $F(4, 123) = 14.45$, $p < .001$, $R^2_{\text{adjusted}} = 0.30$, see Table 12. In the second block, the interaction terms accounted for an additional 7% of the variance in school climate (above and beyond the main effects), $R^2_{\text{change}} = 0.07$, $F_{\text{change}}(7, 120) = 4.39$, $p = .006$, ($R^2_{\text{total}} = 0.39$ and $R^2_{\text{adjusted}} = 0.35$).

Results from the final block, with all predictors entered into the model, showed that the average school climate functioning score was 3.51 points ($SE = 0.01$), holding all other variables constant, $t(120) = 244.89$, $p < .001$. Each of the predictors from the first block except diversity, including roster size, grade salience, and race salience uniquely school climate ratings (slope

coefficient *t*-test *p*-values = < .001, < .001, and .003 respectively). Schools with one standard deviation increase in school roster size were predicted to have a decrease in school climate by .07 points, holding all else constant ($b = -0.07$, $\beta = -0.34$, $SE = 0.01$), $t(120) = -4.10$, $p < .001$, $sr^2 = 0.09$. Schools who demonstrated one standard deviation increase in grade salience were predicted to have an increase in school climate rating by .06 points, holding all else constant ($b = 0.06$, $\beta = 0.29$, $SE = 0.02$), $t(120) = 3.60$, $p > .001$, $sr^2 = 0.07$. Schools with one standard deviation increase in race salience were predicted to have a decrease in school climate rating by -0.05 points, holding all else constant ($b = -0.05$, $\beta = -0.23$, $SE = 0.02$), $t(120) = -3.01$, $p > .007$, $sr^2 = 0.05$. Diversity ($b = -0.01$, $SE = 0.02$), $t(120) = -0.46$, $p = .648$, was not uniquely predictive of school climate.

Finally, there was also a significant interaction effect between school roster size and student diversity percentage, ($b = 0.04$, $SE = 0.01$), $t(120) = 2.76$, $p = .007$, $sr^2 = 0.04$, indicating that the effect of school roster size on school climate depends on the level of student diversity. To interpret the interaction, predicted values were plotted for each group by diversity percentage levels (low = -1 *SD*, mean, and high = +1 *SD*). As illustrated in Figure 6, the effect of school size was greater for schools with low diversity (small schools with one standard deviation below average of student diversity had a predicted outcome difference of .26 school climate rating higher than large schools with a similar diversity percentage) whereas there was much less advantage for schools with high diversity (small schools with one standard deviation above average of student diversity percentage had a predicted outcome difference of .10 school climate rating higher than large schools with a similar large diversity percentage). As the student diversity percentage increased from a low percentage to a high percentage, small schools were predicted to decrease their school climate rating by .11 points, while large schools were predicted

to increase their school climate rating by .05 points. Interactions of school roster size with grade salience and race salience were not found to be significant, see Figures 7 and 8.

Chapter V: Discussion

Summary of Findings

This study employed data from the National Longitudinal Study of Adolescent to Adult Health (Add Health) to examine the relationship between school social network variables and adolescent students' school-level perceptions of school climate. School climate is a multi-dimensional construct that largely represents a student's feelings of connectedness with the school institution and social community. As a result, positive perceptions of school climate have been linked to improved outcomes across a broad spectrum of student life, including academics, social-emotional health, and pro-social behavior. While climate is frequently examined through individual school attributes (e.g. school safety, academic achievement, delinquency), little research has been done to explain its relationship to the patterns of social relationships within the student population. In order to understand the transactional relationship between school climate and network structure, a quantitative cross-sectional design was used to analyze data at the school level through standard and sequential multiple regression analyses. In addition, interaction terms were created in order to understand the way that school size moderates the relationship between school climate and particular social network variables. Significant transactional relationships with school climate were found with both school size and racial salience, while a significant interaction effect was found between school size and racial diversity. Results indicate important implications not only for school size, but the organizational makeup of social sub-divisions within the school.

Network Density, one of the oldest and frequently referenced variable in school network literature, represents the overall interconnectivity of relationships within a social network. It was not surprising, then, that school network density was found to explain significant unique variance

in predicting a positive school climate. As high network density is often regarded as a positive attribute of school friendship networks, the reasoning follows that higher density suggests the presence of greater social support and a more stable community network (L. Haynie, 2001b; Reagans & Zuckerman, 2001). Through more nuanced analysis however, density appears to act more as a catalyst for reinforcing the norms and attitudes of the corresponding group, regardless of whether it is a prosocial or antisocial outcome (Maroulis & Gomez, 2008; Morgan & Sørensen, 1999). Bourdieu (1986) gives the example of a gang-network, in which there may be high density, but the consequences of which lead to a stability of negative social norms, and subsequently, negative outcomes.

In a school setting, a dense student social network may serve to reinforce the institutional norms and attitudes of the larger school community, which contributes to the resulting unique positive relationship with school climate. When examining the transactional relationship, however, school climate did not significantly and uniquely predict an increase in school network density above and beyond the influence of demographic variables, specifically the influence of racial diversity. This suggests a complex, but appropriate application of the original conceptual model. While a positive climate arises from a dense school network, density itself is tied to elements of the demographic make-up of the student body. An increasingly diverse student population will naturally tend toward friendship networks that fall along divisions of racial similarity, increasing racial salience (as demonstrated) and subsequently decreasing overall network density (Moody, 2001). This is not to say that higher school diversity will necessarily result in a lower overall school climate. In fact, there is research to support the claim that when schools promote issues of racial and ethnic diversity and support inter-ethnic relationships in a diverse community, students benefit from decreased perceptions of social and more diverse

social ties in later life (Emerson, Kimbro, & Yancey, 2002; Spivak, White, Juvonen, & Graham, 2015). Similar to the nature of density, racial diversity may benefit students when its treatment aligns with a school's prosocial norms and attitudes. This promotion of positive racial and ethnic ecology may not exist in many schools, and as suggested in these data, a school's racial diversity if not handled sensitively and thoughtfully may create more barriers than bridges toward network cohesion and positive climate.

The tendency for social division along intra-ethnic friendships is a key element in these findings, and is represented through the significant relationship found between racial salience with school climate. As a predictor of negative perceptions of school climate, high levels of racial salience were indicative of social sub-groups that were divided by a shared racial identity. While these in-group preferences may have some direct social benefit, they appear to ultimately predict an aggregate decrease in school climate, which is reflected of a general decrease in belongingness and connectedness to the school. This is consistent with literature on social categorization and social identity theory, and indicates that racial/ethnic divisions in schools lead to decreased belonging, prosocial behavior, and increased discrimination (Battistich, Solomon, Kim, Watson, & Schaps, 1995; Johnson, Crosnoe, & Elder, 2001; Tajfel & Turner, 2004). In this case, if the social organization of a school does not align to an identifiable institutional structure, students will have a difficult time recognizing cohesive norms and attitudes that are consistent with the institution. As similarly represented through the transactional findings, a school that does not create the perception of positive climate will encourage the students to shy away from the institutional structure and form friendships based on racial identity.

Complimentary findings to support this hypothesis are represented through the significant relationship uncovered between school climate and grade salience. As climate increases, so does

students' affinity for a social structure that is founded on the schools' institutional structure. In the case of most secondary schools, this means a social division based on grade levels: an institutional sub-structure of the greater student body. Furthermore, research supports the benefits of other school-based organizational substructures, such as non-academically based student tracks, extracurricular activities, or the "house system" frequently employed in commonwealth schools (Feld, 1981; Holland & Andre, 1987; Moody, 2001; Raywid, 1996). The implementation of these sub-structures is discussed in the following section on implications for practice.

Consistent with this reasoning, the data reveals school size as one of the most significant factors in a students' perception of school climate. In concurrence with prior research, smaller schools generally foster higher engagement, a safer community, and more healthy relationships than similar, higher-population schools. As an aggregate perception of these outcomes, school climate will naturally tend to decrease as a school's roster size rises. Through application to the Integrated Network Model of School Climate, this may be accounted for not only through changes in school performance or access to resources, but through the shifting organizational structure and the social-contextual perceptions that separate small and large groups. On one hand, smaller schools are reported to provide more individualized student-teacher relationships, provide more opportunities for pro-social behaviors, and increased academic engagement (Cotton, 2001; Koth et al., 2008; Stevenson, 2006). Organizationally, small schools are able to maintain a *contextualized* school experience. Students feel as if they are a part of the school because they are able to perceive their place in the school ecology and their role in the organizational schema (Crosnoe, Johnson, & Elder, 2004). The school experience feels more applicable to their experience and individualized to their needs. Conversely, large schools

provide a *decontextualized* school experience. In other words, “size operates as an ‘ecological’ feature of a school's social structure, part of the physical or material environment that influences the nature of social interactions” (Ready, Lee, & Welner, 2004, p. 2). Large schools formalize the organizational ecology, creating distance between the individual and the communal whole.

While falling into a long lineage of educational research to confirm the climate benefits of smaller schools, the interaction of school size also contributes to the common caveat: one size does not fit all. Moderator analysis revealed that the relationship between school climate and racial diversity was moderated by school size (see Figure 6). That is, as the diversity within a small school increases (from 25% to 75% non-white students), there is a predicted one standard deviation (0.16 point) decrease in the aggregate student rating of school climate. In contrast, as the diversity within a large school increases, there is a predicted 0.04 point increase in school climate rating. In other words, an increase in student diversity manifests as decreased climate for smaller schools, and increased climate for larger schools. This interaction provides a more nuanced interpretation of the contextual/decontextual shift that occurs between school sizes, and reveals the important roles of social identity and social mobility.

The formation of students’ racial, sexual, and social identity is at its peak during the adolescent years, and the structure of their school social network can be highly influential in both this formation, and subsequent outcomes (Tajfel & Turner, 2004). Students are searching for who they are, and how they may fit in to the world around them. For students who identify with the non-dominant culture/race/ethnicity, the social structure of their school is highly influential to their perception of school climate (Dovidio, Gaertner, Isen, & Lowrance, 1995). As large schools become more diverse, students from traditionally marginalized populations feel more comfortable embedded in a large community of non-dominant others (Battistich et al., 1995).

Unlike a mostly-white student population, a diverse school can benefit from the decontextualized large-school environment and produce a more positive perception of school climate. On the other hand, while the general benefits of attending a small school are credited to a more direct, observable connection to the school community, a small, racially diverse school may contribute to a more direct, observable measure of the *differences* between student groups rather than the similarities (Fowler & Walberg, 1991; Tajfel & Turner, 2004). In other words, what usually confers benefit to a small, white school, is conversely detrimental to the climate of a small diverse school. This perception of social division may also be exacerbated by the network constraints of a small school's limited social mobility. Students in smaller, more contextualized school environments find far less flexibility in their ability to move between social groups and are often confined to a consistent social group despite personal shifts in growth and identity development (Portes, 1998; Stanton-Salazar, 1997). Large schools however, are far less rigid, and a high diversity in particular may provide a much greater degree of social mobility between social groups (Crosnoe et al., 2004; Fowler & Walberg, 1991).

Mutuality is an example of a network variable that appears neither predictive, nor a predictor of student perceptions of school climate. However, while this quality is statistically non-significant to the outcome of interest, it helps to reveal the importance of school climate's relationship with the greater social-contextual structure of the school. In the context of a nomological network, through defining what school climate *isn't*, it gives a more complete picture of what it *is*. Unlike race salience, grade salience, school size, and density, mutuality is representative of personal, dyadic relationships between students. Because these mutually nominated friendships are a part of individual social structures, they are not easily perceived within the generalized school community at a school-wide level of analysis. Conversely, while it

is relatively easy to perceive school-wide social divisions based on race, for example, high numbers of mutual friendships are not easily observed in the larger student body. Gender salience's non-significant relationship with school climate may be rooted in similar theory, that students' preference for intra-gender friendships are not readily perceptible as those defined by race or grade-level. In other words, while a student's rating of school climate may be influenced by individual friendships preferences, these individual preferences are not as significant as the perception of the greater social patterns within the school community. As such, it is possible these findings are an artifact of the school-wide level of analysis, and that through analysis of individual student perceptions or nested egocentric networks, mutuality and gender salience would emerge as significant predictors of school climate. Furthermore, while it is important to note that while mutuality and gender salience may not significantly predict school climate, a school's racial diversity predicts a decrease in the formation of mutual friendships and an increase in the formation of intra-gender friendships. As such, while these variables may not form a direct relationship with school climate, they may provide considerations in the development and implementation of school-wide climate interventions, particularly around the previously mentioned issues of racial social divisions.

Neither student academic achievement nor family income appeared to be significantly predictive of any network variables. Three plausible explanations for this are that either a) due to high covariance between control variables (diversity, income, and achievement), the model did not reveal significant shared variance with the outcome, b) there is a theoretical flaw in the representation of these constructs, and they may have been better represented through other forms of measurement (e.g. income may have been better represented as the diversity of income, or spread of family incomes within the school), or c) family income and achievement may not

share a statistically significant relationship with school climate. Through consultation of prior climate literature, it is most likely the former two explanations, and are addressed in the limitations section of this study.

Implications for Practice

Based on the findings of this research, the relationship between school social network structure and students' perception of school climate allow for the creation of efficient, practical, and effective programs to improve student and school outcomes, and can be predicated on three interrelated implications for future dissemination. The first is the role of school size and an understanding of how a larger student body not merely detracts from positive perceptions of climate, but differentially affects the student population depending on its social or racial composition. Second is the nature of social divisions within a school, and its basis in either individual attributes (such as racial preference) or organizational school sub-structures. Finally, and in conjunction with the first two, is the concurrent increase of network density alongside the promotion of pro-social norms and expectations. For each of these implications, the mechanisms for change are woven from a common thread: the impact of a school's organizational structure on the social-contextual experience of the student body.

For large schools, this means focusing on mitigating the negative effects of a decontextualized school experience through implementation of pro-social, school-focused social sub-structures. The intentional design of racially and socially diverse extracurricular activities, intra-grade-level collaboration, nonacademic tracking programs, and school-wide house systems all have been shown to improve feelings of school belonging, academic achievement, and school engagement (Holland & Andre, 1987; Moody, 2001; Raywid, 1996). While the student composition of extracurricular clubs, groups, and athletic teams is not a traditional area of focus,

schools have been shown to both successfully manage this composition and subsequently produce positive outcomes (Holland & Andre, 1987). By promoting diverse student groupings within extracurricular activities, schools are able to break down social divisions based on race, gender, and socioeconomic status. Similarly, while the outcome of academic student tracking systems frequently create racial and socioeconomic divisions (and thus increase social divisions based on such), nonacademic student tracks and strong intra-grade collaboration create substructures that allow friendships across demographic boundaries (Moody, 2001). Less commonly employed in American public schools, the house-system's formation of smaller, individualized sub-communities is hypothesized to provide similar benefits of a small school while maintaining a greater organizational structure, and have been shown to improve student engagement, social-emotional health, and achievement (Oxley, 1990, 2001). Moody's (2001) research follows the hypothesis that these school-level substructures help to encourage friendships based on school norms rather than racial preference, reducing feelings of isolation and improving school experience.

For small schools, the organizational structure of a school is often already well defined in a contextualized experience. In this case, the implementation of these substructures do not play as significant a role as the composition of school norms, values, and expectations that define the quality of social and institutional relationships. While small schools are naturally possessed of higher network density, Haynie (2001) demonstrates that higher density only allows for a greater *potential* for positive outcomes. Improving climate in smaller schools necessitates a curricular focus on prosocial interactions, social-emotional literacy, and, particularly for highly diverse schools, an emphasis on promoting positive interracial relationships. Research has shown that not only can these relationships be nurtured through classroom and school-level programming,

but that their development produces positive social, academic, and health outcomes (Elias & Haynes, 2008; Spivak et al., 2015; Watkins & Aber, 2009).

Limitations

There are several limitations to this study that are common to social network research involving the Add Health Dataset. One limitation is that the design of the friendship nomination survey limits responses to a maximum of 5 male and 5 female friends. While this may not allow for a true representation of all social ties, Haynie (2001) notes that very few students were affected by the restricted nomination process. She notes that the mean number of friendship nominations made by students was 4.15, with a standard deviation of 3.02. This, however, still places an upper constraint on students who may play important central roles in developing and maintaining friendships, particularly with only one gender.

Another limitation is that this study does not look for specific gender-based differences in the effects of relationships on school climate. Prior research from Kuperminc et al., (2001) suggests that there is a greater association between the quality of interpersonal relationships and adjustment problems in adolescent girls than their male counterparts. Despite the fact that gender may play a role in moderating school climate effects, there are no current plans to involve detailed analysis on the effects of gender in this study.

Finally, the items drawn from the Protective Factors and Academics section of the in-school survey may not be the very best option for measurement of school climate. While the seven items have good precedent in prior literature and are sufficient in their internal consistency (.73-.75), a comparison of similar measures indicates that assessments adapted specifically to school climate (such as the California School Climate Survey or the Psychological Sense of School Membership Scale) are more consistent.

As discussed briefly, one limitation is drawn from the chosen representation of family income and academic achievement. While the median family income is a general baseline of economic status in the school community, it gives no understanding of the diversity of income throughout the school. As common in US census data, this could be addressed through calculating a spread at 20-80% of family incomes to create a measure of income diversity. This variable could yield important information on the social divisions that may arise through socio-economic status, including an additional network variable, “economic salience.”

While the Add Health dataset is impressive in scope and depth, the available sample size may limit the ability to detect significant relationships between variables of interest. This creates methodological boundaries to continued study of latent constructs, as use of Structural Equation Modeling in the study of school-wide constructs requires large, randomized samples that are not accessible without major funding and effort. This presents practical challenges to the proposal of school-wide climate research, and may limit the development and implementation of effective climate interventions.

Furthermore, while the use of a school-wide analysis allows for a crucial understanding of the holistic perception of climate across the student body, it does not allow for the ability to address more nuanced understanding of certain network variables and climate measurement. The use of multi-level modeling or more sophisticated egocentric network analysis would account for measurement and analysis of a clustered design at the school and individual student level.

Future directions

The results of this study indicate that there is a complex transactional relationship with elements of schools’ social network structure and the students’ perception of school climate. Regardless, there are several recommendations for future research in applying social network

structure to school climate outcomes. First, it is recommended that alternate statistical methods be employed to gain a more nuanced understanding of school climate's relationship with network structure. Structural Equation Modeling (SEM) would be useful in a closer examination of the climate as a latent variable system, while Hierarchical Linear Modeling (HLM) could address clustering of individual students within school groupings. More advanced social network analyses should be explored as well, including Exponential Random Graph Modeling (EGRM) to understand unique network structures at the egocentric and network level. Second, it is recommended that the findings of this research be confirmed with a more contemporary sample. Collected 20 years ago, the Add Health Wave I data may provide results that are not reliable due to changes in US educational policy, treatment of racial and sexual diversity, and altered perceptions of safety and school violence. Third, it is recommended that more recent waves of Add Health data be examined in the context of a longitudinal design. The effects of a positive perception of school climate has not been applied to life-course outcomes, and could yield some valuable information regarding the long-term significance of promoting positive climate or specific network structures.

Fourth, it is recommended that future research address the integration of social network structure into the design and implementation of school climate interventions. The patterns of student social relationships, specifically around the salience of racial preference, can be used to inform systemic changes in student perception of school climate. Furthermore, school-based social substructures of grade level, nonacademic tracking, extracurricular activities or house-system divisions can be leveraged to support a positive relationship with the school institutional structure. In intervention design and implementation, careful attention must be paid to the size of

the student body, and the potential interactions with the contextualized/decontextualized perception of the school, particularly when in service of diverse communities.

Beyond building a framework for the application to school climate reform, the larger goal of this study is to forge a path into the future of transdisciplinary research. In that vein, it is recommended that future educational researchers incorporate theory and methods from disciplines outside of education. Through intentional and meaningful collaboration with diverse disciplines, educational research can build off of a broad base of alternative paradigms and methodologies to better understand the complex social worlds of schools and how they influence students' perceptions and performance. This movement toward disciplinary inclusion will not only function to enlighten our future work, but ultimately, to better the lives of the children we serve.

Figure 1. The Integrated Network Model of School Climate

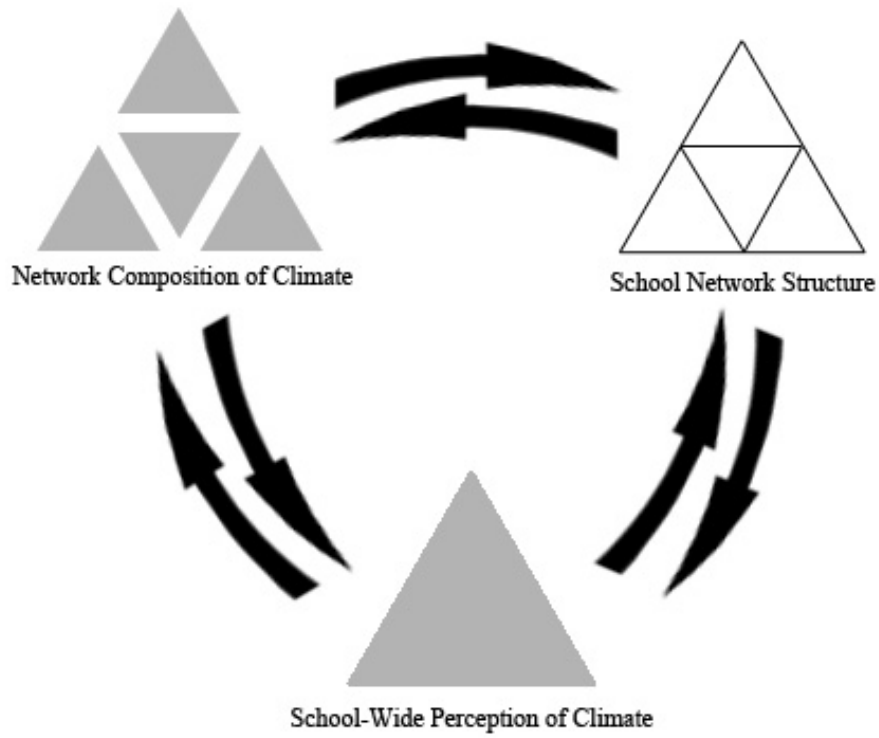


Figure 2. The Integrated Network Model of School Climate Area of Interest

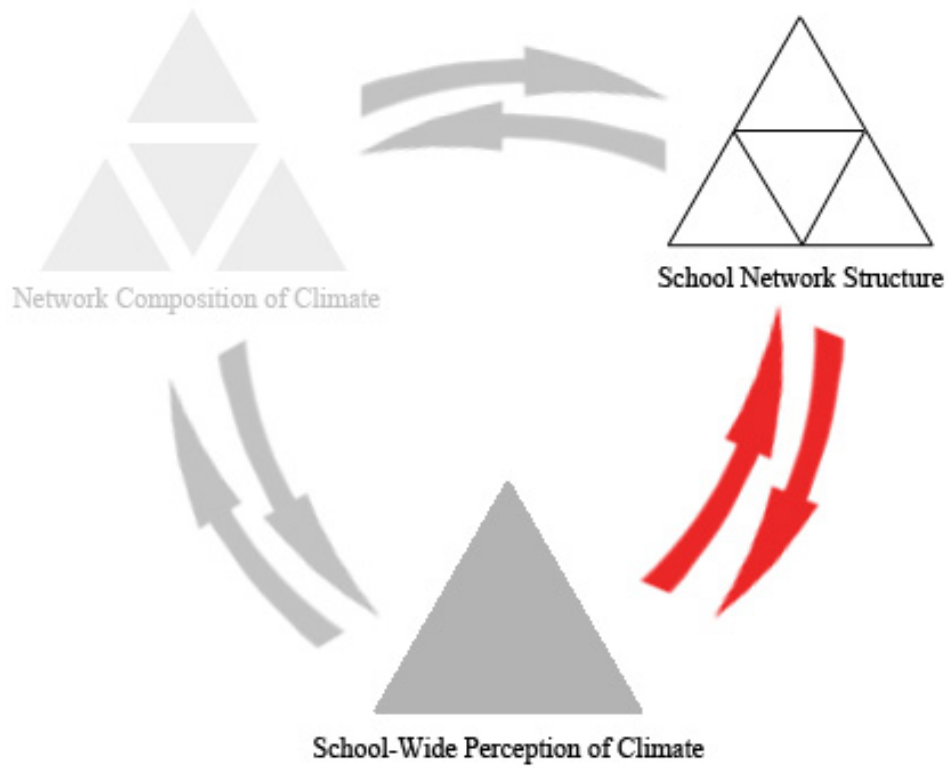


Figure 3. Example of Network Density

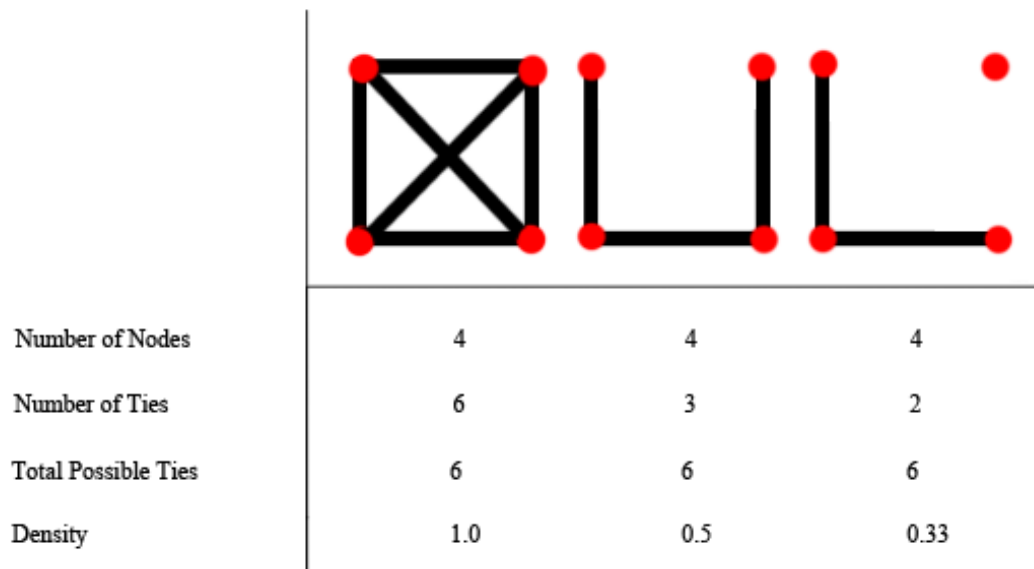
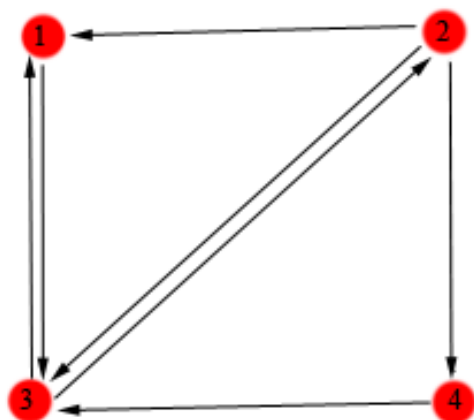


Figure 4. Example of Network Mutuality

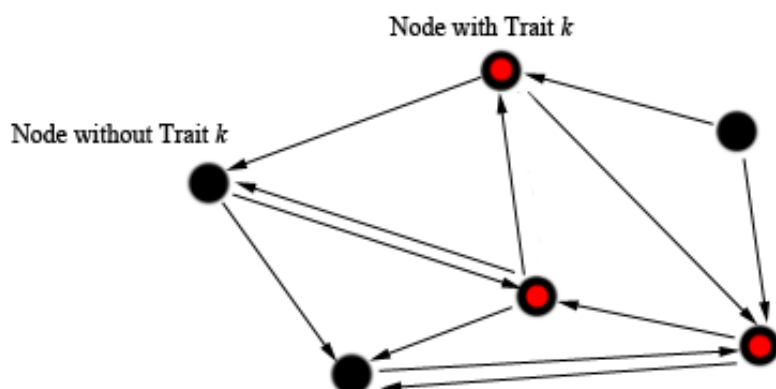


Node	1	2	3	4
In-degree	2	1	3	1
Out-degree	1	3	2	1

Mutually nominated dyads: (1,3) (2,3)

Mutuality index = .07

Figure 5. Example of Network Saliency



Total number of nodes	6
Nodes with Trait k	3
Number of ties sent by those with Trait k to those with Trait k	3
Total number of ties sent by those with Trait k	7
Saliency of Trait $k = 0.86$	

Figure 6. School Size Interaction with Diversity

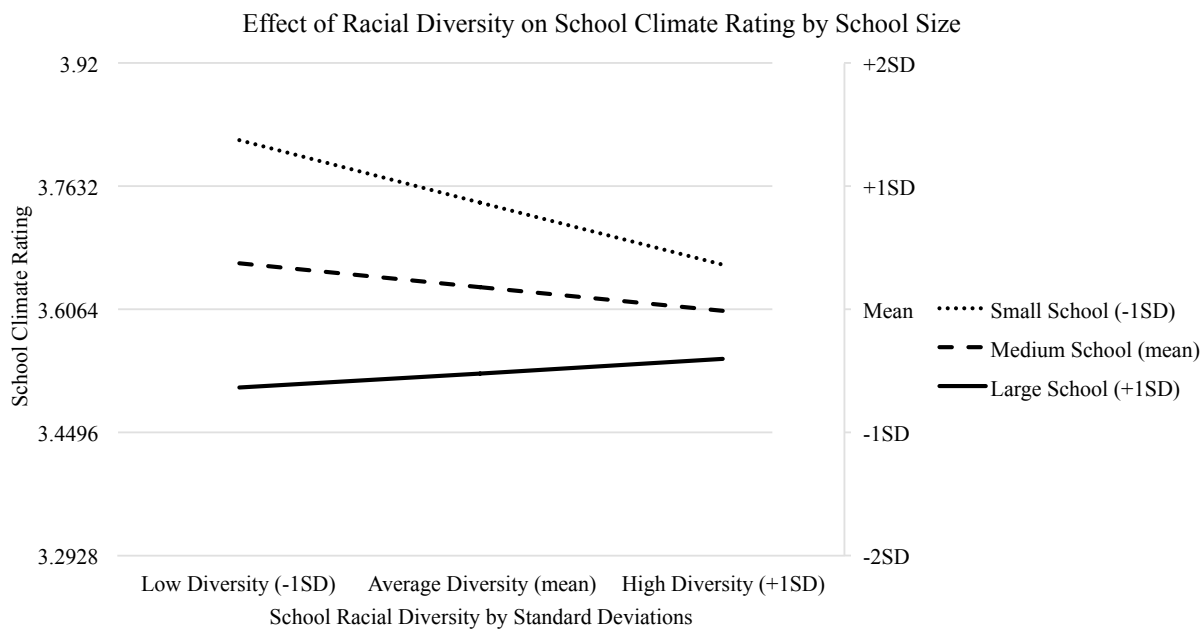


Figure 7. School Size Interaction with Grade Salience

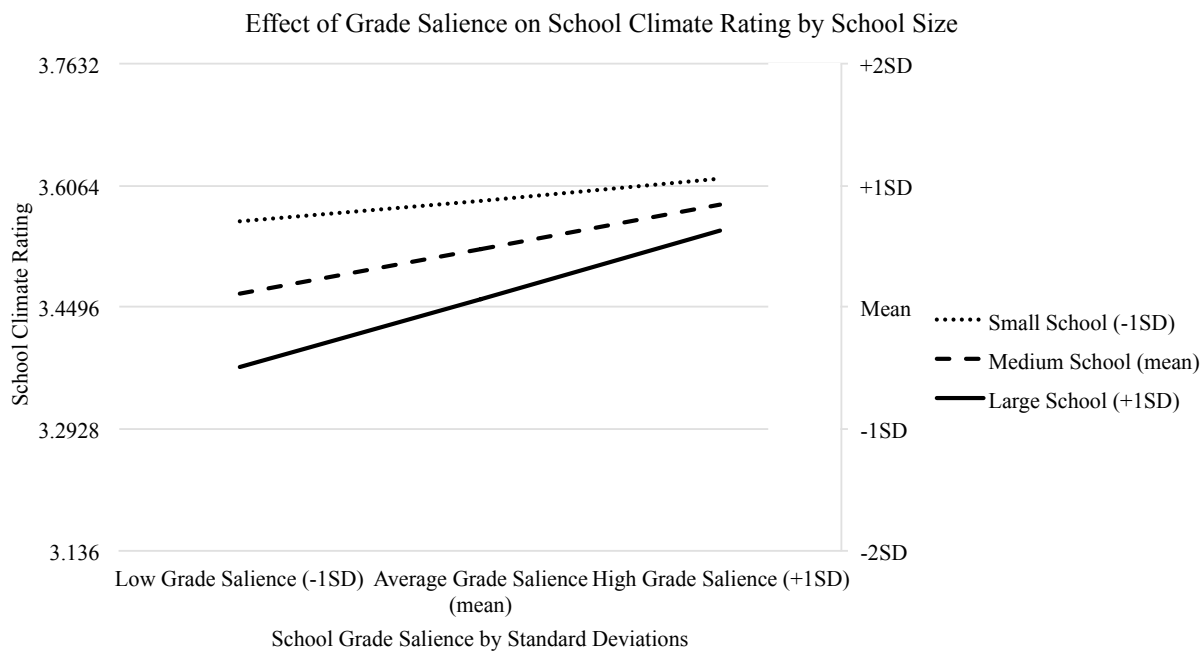


Figure 8. School Size Interaction with Race Salience

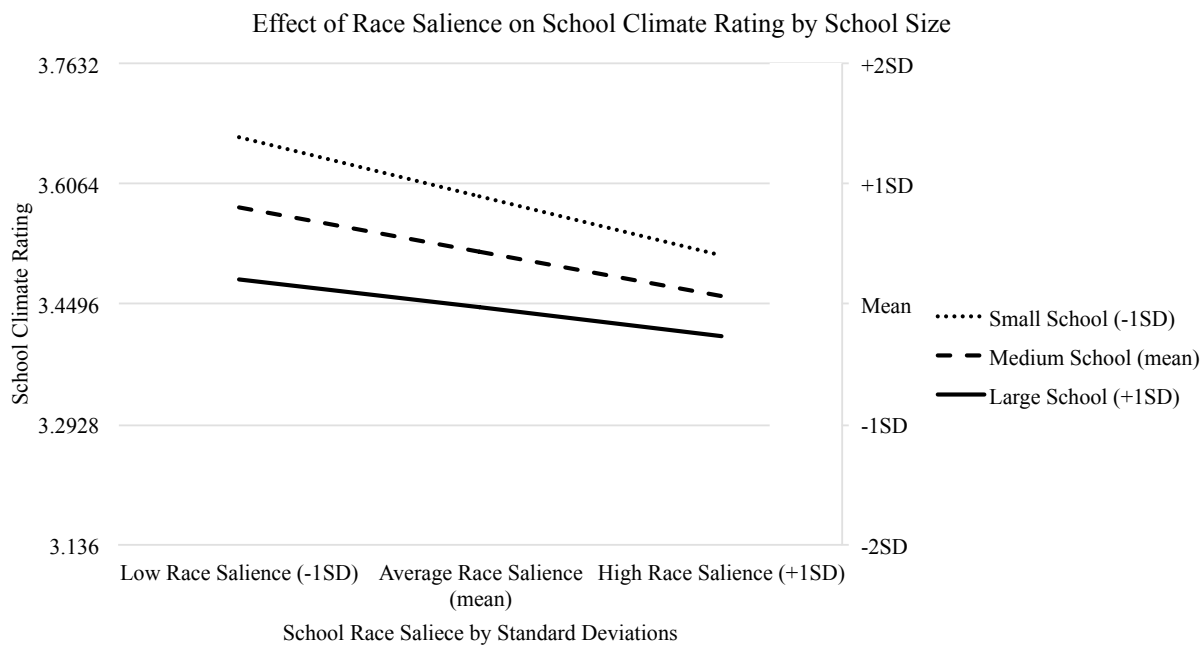


Table 1. School-Level Demographic Information

	Mean/Percent	Standard Deviation	Minimum	Maximum
<i>School-Level Variables n = 128)</i>				
Mean school climate rating	3.52	(.19)	3.09	4.18
Percent White	48.2	(25.2)	0	85.9
Percent Black	14.0	(23.8)	0	89.4
Percent Latino	11.4	(13.6)	0	93.2
Public	89.9			
Private	10.1			
Urban	21.8			
Suburban	59.6			
Rural	18.6			
School Size	794.9	(618.1)	42	3334
Class Size	22.6	(6.7)	10	39
Percent at or above grade level (n = 91)	79.8	(14.0)	40	100
Family income (in thousands) (n = 91)	38.2	(15.3)	14	110

Note: Standard deviations, minimum, and maximum not given when descriptive is a percent of all schools.

Table 2. Descriptives and Zero-Order Correlations for School Climate Outcome

Measure	<i>M</i>	(<i>SD</i>)	1.	2.	3.	4.	5.	6.	7.
<i>Outcomes</i>									
1. School Climate	3.52	(0.19)	--						
<i>Predictors</i>									
2. Density	0.43	(0.11)	.24 **	--					
3. Mutuality	0.38	(0.05)	.12	.27 **	--				
4. Salience of Grade	0.71	(0.13)	.31 **	-.15	-.05	--			
5. Salience of Race	0.24	(0.19)	-.39 **	-.17 *	-.13	-.20 *	--		
6. Salience of Gender	0.20	(0.07)	.18 *	-.39 **	-.22 *	.61 **	-.16	--	
7. Roster Size	794.86	(618.05)	-.43 **	-.28 **	-.03	-.15	.22 *	-.06	--

Note. *N*=127.

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

Table 3. Descriptives and Zero-Order Correlations for Network Variable Outcomes

Measure	<i>M</i>	(<i>SD</i>)	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
<i>Outcomes</i>												
1. Density	0.43	(0.11)	--									
2. Mutuality	0.37	(0.05)	.37 ***	--								
3. Saliency of Grade	0.71	(0.12)	-.20	-.10	--							
4. Saliency of Race	0.25	(0.19)	-.08	-.11	-.29	--						
5. Saliency of Gender	0.21	(0.07)	-.53 ***	-.21 *	.66 ***	-.10	--					
6. Roster Size	799.36	(658.01)	-.30 **	.03	-.17	.16	-.03	--				
<i>Block 1 Predictors</i>												
7. Income	35.69	(13.01)	.16 *	.34 ***	.22 *	-.18	-.06	.11	--			
8. Diversity	55.43	(26.24)	-.59 ***	-.59 ***	.11	.21 *	.37 ***	.17	-.41 ***	--		
9. Achievement	78.62	(14.10)	.22 *	.32 **	.11	-.15	-.09	-.04	.48 ***	-.41 ***	--	
<i>Block 2 Predictors</i>												
10. School Climate	3.52	(0.19)	.18 **	.13	.36 ***	-.33 ***	.12	-.38 ***	.13	-.15	.01	--

Note. $N=91$. Income is reported family income in thousands of dollars. Diversity is percentage of non-white students attending the school. Achievement is percentage of students at or above grade level on standardized state testing.

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

Table 4. Descriptives and Zero-Order Correlations for Interaction Terms

Measure	<i>M</i>	<i>(SD)</i>	1.	2.	3.	4.	5.	6.	7.	8.
<i>Outcomes</i>										
1. School Climate	3.52	(0.19)	--							
<i>Block 1 Predictors</i>										
2. Roster Size	794.86	(618.05)	-.43 ***	--						
3. Diversity	51.81	(25.19)	-.12	.15 *	--					
4. Salience of Race	0.24	(0.19)	-.40 ***	.23 **	.20	--				
5. Salience of Grade	0.71	(0.13)	.31 ***	-.15	.06	-.20 *	--			
<i>Block 2 Predictors</i>										
6. Size * Diversity	--		.11	.23 **	.08	-.01	-.13	--		
7. Size * Race Salience	--		.11	.09	-.02	-.11	-.12	.20 **	--	
8. Size * Grade Salience	--		.18 *	-.37 ***	-.17 *	-.13	-.26 **	-.05	-.10	--

Note. $N=128$. Diversity is in percentage of non-white students attending the school.

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

Table 5. Model Results for School Climate

	R^2_{total}	R^2_{adjusted}	$F(6,120)$	p	b	(SE)	$t(120)$	p	sr^2
<i>School Climate</i>	0.35	0.32	10.86	<0.001					
Intercept					3.52	(0.01)	250.02	<0.001	***
Density					0.04	(0.02)	2.10	0.038	*
Mutuality					0.01	(0.02)	0.75	0.454	0.00
Grade Saliency					0.03	(0.02)	1.85	0.067	0.02
Race Saliency					-0.05	(0.02)	-3.17	0.002	**
Gender Saliency					0.02	(0.02)	1.02	0.310	0.01
Roster Size					-0.06	(0.02)	-3.65	<0.001	***

Note. $N=127$. All coefficients have been standardized

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

Table 6. Model results for Roster Size

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.07	0.07	0.04			0.14 ***	0.21 ***	0.17		
<i>Coefficients</i>										
Intercept				810.57 ***					814.96 ***	
Family Income				194.25	0.05				235.93 *	0.07
Diversity				156.55	0.05				122.74	0.03
Achievement				-30.13	0.00				-55.87	0.01
School Climate									-254.08 ***	0.14

Note. $N=91$. All p -values are corrected via Bonferroni method to adjust for multiple models. All coefficients have been standardized. Block 1 F -change test $df=3, 88$; Block 2 $df=4, 87$.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7. Model Results for Density

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.33 ***	0.33 ***	0.30			0.01	0.33 ***	0.30		
<i>Coefficients</i>										
Intercept				0.44 ***					0.44 ***	
Family Income				-0.02	0.02				-0.02	0.02
Diversity				-0.06 ***	0.29				-0.06 ***	0.27
Achievement				0.00	0.00				0.00	0.00
School Climate									0.01	0.01

Note. $N=91$. All p -values are corrected via Bonferroni method to adjust for multiple models. All coefficients have been standardized. Block 1 F -change test $df = 3, 88$; Block 2 $df = 4, 87$.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 8. Model Results for Mutuality

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.38 ***	0.38 ***	0.35			0.00	0.38 ***	0.35		
<i>Coefficients</i>										
Intercept				0.38 ***					0.38 ***	
Family Income				0.01	0.01				0.01	0.01
Diversity				-0.03 ***	0.21				-0.03 ***	0.20
Achievement				0.00	0.00				0.00	0.00
School Climate									0.00	0.00

Note. $N=91$. All p -values are corrected via Bonferroni method to adjust for multiple models. All coefficients have been standardized. Block 1 F -change test $df = 3, 88$; Block 2 $df = 4, 87$.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 9. Model Results for Grade Salience

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.11 *	0.11 *	0.08			0.14 ***	0.24 ***	0.21		
<i>Coefficients</i>										
Intercept				0.72 ***					0.72 ***	
Family Income				0.05 *	0.07				0.04	0.05
Diversity				0.03	0.05				0.04 *	0.07
Achievement				0.01	0.00				0.02	0.01
School Climate									0.05 ***	0.13

Note. $N=91$. All p -values are corrected via Bonferroni method to adjust for multiple models. All coefficients have been standardized. Block 1 F -change test $df = 3, 88$; Block 2 $df = 4, 87$.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 10. Model Results for Race Salience

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.06	0.06	0.03			0.12 ***	0.13 ***	0.10		
<i>Coefficients</i>										
Intercept				0.24 ***					0.24 ***	
Family Income				-0.02	0.00				-0.01	0.00
Diversity				0.03	0.02				0.02	0.01
Achievement				-0.01	0.00				-0.01	0.00
School Climate									-0.06 *	0.09

Note. $N=91$. All p -values are corrected via Bonferroni method to adjust for multiple models. All coefficients have been standardized. Block 1 F -change test $df = 3, 88$; Block 2 $df = 4, 87$.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 11. Model Results for Gender Salience

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.15 ***	0.15 ***	0.12			0.03	0.18 ***	0.15		
<i>Coefficients</i>										
Intercept				0.20 ***					0.20 ***	0.00
Family Income				0.01	0.00				0.01	0.00
Diversity				0.03 ***	0.14				0.03 ***	0.16
Achievement				0.00	0.00				0.00	0.00
School Climate									0.01	0.03

Note. $N=91$. All p -values are corrected via Bonferroni method to adjust for multiple models. All coefficients have been standardized. Block 1 F -change test $df = 3, 88$; Block 2 $df = 4, 87$.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 12. Model Results for School Climate with Interaction Terms

	Block 1					Block 2				
	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2	R^2_{change}	R^2_{total}	R^2_{adj}	b	sr^2
<i>Model Fit</i>	0.32 ***	0.32 ***	0.30			0.07 ***	0.39 ***	0.35		
<i>Coefficients</i>										
Intercept				3.52 ***					3.51 ***	
Roster Size				-0.06 ***	0.10				-0.07 ***	0.09
Diversity				-0.01	0.00				-0.01	0.00
Race Salience				-0.05 ***	0.07				-0.05 ***	0.05
Grade Salience				0.04 ***	0.04				0.06 ***	0.07
Size * Diversity									0.04 ***	0.04
Size * Race Salience									0.02	0.01
Size * Grade Salience									0.03	0.01

Note. $N=128$. Block 1 F -change test $df = 4, 123$ Block 2 $df = 7, 120$. All coefficients have been standardized.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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