



School building condition, social climate, student attendance and academic achievement: A mediation model



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ABSTRACT

Research investigating student academic achievement points to the contribution of the physical and social context of schools. Previous studies examined either the physical or social environment. The current study examines the social climate and student attendance as mediators of the relation between the physical environment and academic achievement. Secondary data for 236 NYC middle schools were analyzed using structural equation modeling. The model included: 1) building condition assessed by building professionals, 2) social climate measured by the Learning Quality Survey, 3) school level student attendance rate, 4) standardized math and English Language Arts test scores, 5) percent of student body eligible for free and reduced priced meals, and 6) percent of student body identified as minority. Findings indicate that academic achievement is linked to building condition mediated by the social climate and student attendance. The model accounted for 70 percent of the variance in the outcome measures.

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1. Introduction

One of the functions of schools is to promote the acquisition of knowledge and skills. Another important function of schools is to transmit societal values and ideas (Fine, Burns, Payne, & Torre, 2004; Rivlin & Weinstein, 1984). These values are communicated in a number of ways including through the school's social and physical environment. School buildings are public places and therefore represent the communities where they are located. A well-designed and well maintained public building usually indicates that society values the activities that take place in the building and, by extension, the people who use the building. Therefore, the quality of a school building may communicate to the students, teachers, and staff that they are valued and that their activities are important.

Interpersonal relationships amongst a school's users (students, teachers, staff and parents) are a fundamental part of a school's social environment (also referred to as the social climate) (Bryk & Schneider, 2002). Through this system of relationships values, expectations and mutual respect are communicated to all of the school's users. In other words, the social climate of a school is a potentially important contributing factor to student outcomes.

While previous research has examined either the relation of the

physical environment or the social environment to student academic outcomes, the premise of this study is that the quality of the social and the physical environment are linked to each other and both are linked to student academic outcomes. In addition, this study examines the possible role of the social climate and student attendance as mediators of the relation between the school's physical environment and student academic achievement.

2. Theoretical foundation

Place identity theory and the bio-ecological model of human development form the theoretical basis for this investigation. Place identity theory states that children develop a sense of who they are, in part, through interactions with their physical surroundings (Proshansky & Fabian, 1987). Interactions with, and understanding of, the places of their daily lives contributes to children learning who they are. The proximal settings of home, school, and neighborhood are where children spend most of their waking time and therefore play a critical role in child development. These are the places where the child most closely interacts with the physical environment and where important social relationships form with family, teachers, other adults, and peers (Bronfenbrenner & Morris, 1998; Bronfenbrenner, 1979). Relationships with the physical and social environment are the principal context for development. Reciprocal relationships with proximal settings provide additional feedback about the child's identity.

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The school is one of a child's micro-systems (the others are home and neighborhood). During the time a child is in school he or she engages in numerous interactions with other people and with the physical environment. Bronfenbrenner describes these interactions as proximal processes and identifies them as the “engines of development” (Bronfenbrenner, 1979). In school the child interacts with the teacher, other adults, classmates and other peers. The child engages in a variety of activities during the school day including listening, writing, using technology, eating, physical activity, and personal hygiene. Bronfenbrenner's conceptualization of the school as a micro-system implies that there is an interrelationship between all aspects of a school. The activities, social interactions, and physical places are all part of the school as a micro-system.

The physical quality of spaces is often overlooked when designing educational programs intended to improve student learning. Woolner, Hall, Higgins, McCaughey, and Wall (2007) note that the relationship between the physical environment of schools and student outcomes is “multi-factorial” and that possible mediating “chains” should be investigated. The current study examines one possible chain between school buildings and academic outcomes by investigating the relatively under-examined question regarding two mediators in this relationship, school social climate and student attendance.

3. Literature review

Previous research has examined links between the quality of the school's physical environment and student outcomes, as well as the role of the school's social climate in student outcomes. For the purposes of this study, review of the school building condition literature is limited to studies examining architectural/engineering attributes and/or building aesthetic attributes. Next, literature highlighting ways in which the school's social climate is related to student outcomes is summarized.

3.1. School building condition: linkages between school building attributes and student outcomes

3.1.1. General building condition

Significant correlations between negative structural and aesthetic attributes of school buildings and poor student learning and achievement have been documented at the school and district level (Al-Enezi, 2002; Cash, 1993; Earthman, Cash, & Van Burkum, 1995; Hines, 1996; Lewis, 2001; Maxwell, 1999; Boses & Shaw, 2005). Crampton (2009), examining state-wide U.S. national data sets, notes that while human capital (teachers) has the most influence on student achievement, physical capital (school building condition) also makes a significant contribution. Likewise, although student background characteristics such as family SES (as measured by students' eligibility for free and reduced priced school meals) accounts for a portion of the variance for academic achievement scores, studies at the district (Lewis, 2001), state (Tanner, 2009) and national level (Kumar, O'Malley, & Johnston, 2008) found that attributes of school building condition provide additional explanatory power.

In addition to a direct relationship between the physical environment and academic achievement, school building condition may also be related indirectly to academic outcomes. Using school-wide data, student attendance was found to mediate the relation between building condition and English language arts and math standardized test scores in a study of NYC public elementary schools (Duran-Narucki, 2008). Controls were included for ethnicity, family socio-economic status (SES) and teacher quality. Plank, Bradshaw, and Young (2009) call for researchers to more

closely examine the effect of physical disorder in schools on student attendance, achievement, and engagement with learning. Their research suggests that the link between physical disorder and academic achievement might be mediated by social disorder, i.e., social climate.

Poor school building condition is also associated with student problem behaviors such as in-school use of alcohol (Kumar et al., 2008), absenteeism and dropout rate (Branham, 2004; Evans, Yoo, & Sipple, 2010), and a sense that they as individuals are not valued by the larger community (Fine et al., 2004). The latter study provides a qualitative examination of students' perceptions of their school environment. On the other hand, while not based on specific empirical findings, Cooper-Marcus and Sarkissian (1993) and Weinstein (1987), suggest that good school building condition can send a positive message to students that they are valued.

Investigations of elementary and high students' perception of school building condition, and objective evaluation of school building condition with controls for family SES, finds that good school building condition predicts student perceived self-worth, perceived academic competency (Simon, Evans, & Maxwell, 2007) and academic achievement and self-efficacy (Maxwell & Schechtman, 2012). School building aesthetic attributes may also influence students' perception of academic expectations (Uline, Tschannen-Moran, & Wolsey, 2009) and a desire to spend time in school (Booth & Sheehan, 2008). Design features of a school such as student artwork displayed in public areas and positive classroom décor (i.e., student-created personalized displays) are associated with increased student feelings of self-worth (Maxwell & Chmielewski, 2008; Sanoff, 1995; Weinstein, 1987) and identification with the school (Killeen, Evans, & Danko, 2003). Both Maxwell & Chmielewski, 2008 and Killeen et al., 2003 were empirical studies. Design features related to light, choice, flexibility, connections (corridors), complexity, and color have also been found to be correlated with academic achievement in British elementary schools (Barrett, Zhang, Moffat, & Kobbacy, 2013).

3.1.2. Lighting

As the use of technology in the classroom increases, providing appropriate lighting (natural and artificial) becomes more complex. Factors to consider include amount of light, distribution or balance of light, glare, monotonous lighting, type of light, and flexibility of lighting system (Erwine, 2006). Research has centered on amount of light (illuminance) and type of light (i.e., flicker from fluorescent lighting) because these aspects of lighting are associated with discomfort and can impair performance (Winterbottem & Wilkins, 2009). Although a causal relationship has not been established, researchers have found that good classroom daylighting is associated with improved academic test scores (Heschong Mehone Group, 1999; Plympton, Conway, & Epstein, 2000) and the production of stress hormones that affect the ability to concentrate (Küller & Lindsten, 1992). A well-coordinated and integrated daylighting and artificial lighting system that accommodates all forms of technology used in the classroom benefits student learning and health (Erwine, 2006).

3.1.3. Windows and views

Windows in schools are important for daylight but also because of the views provided to students. For example, views to well-designed landscapes from cafeteria windows may be critical as a restorative feature for students (Matsuoka, 2010). Studies have found a positive association between views of nature and improved academic test scores (Heschong Mehone Group, 1999; Tanner, 2009; Matsuoka, 2010). In a study of over 900 Massachusetts schools researchers found that greater green buffer zones viewed by students through windows were associated with higher English

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