

# SCHOOL BUILDING CONDITIONS' INFLUENCE ON STUDENT BEHAVIOR IN A MEDIUM-SIZED DIVISION IN VIRGINIA

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## **ABSTRACT**

*The study examined the relationship between building conditions and overall student behavior as well as the relationship between building conditions and the behaviors of student subgroups that include Caucasian, African American, Hispanic, and Students with Disabilities (SWD). The study controlled for over-crowdedness, socioeconomic status, and attendance. The study included 10 school facilities in a medium-sized school division in Virginia. Building conditions were determined through facility engineering and educational condition. Facility Condition Indexes (FCIs) described facility engineering conditions. The Revised Commonwealth Assessment of Physical Environment (CAPE) instrument initially developed by Cash (1993) and revised by Cash and Earthman (2019) assessed facility educational conditions. The CAPE instrument provided overall, structural, and cosmetic facility condition scores and was administered by principals.*

*Student behavior was determined by student overall behavior indexes as well as subgroup-based behavior indexes representing the ratio of discipline incidents divided by student population. School-specific over-crowdedness indexes were utilized. Free and reduced-price lunch percentages were used as a measure of socioeconomic status. For attendance, the study used attendance indexes described by the percentage of students who were absent at least 10% of the academic year.*

*To establish the potential relationships between building conditions and student behavior in each student subgroup, the study used quantitative analysis utilizing hierarchical multiple-variable regression and analysis of variance (ANOVA) through the Statistical Package for Social Sciences (SPSS). The researchers conducted individual single-predictor and multiple-variable hierarchical regression models. ANOVA was utilized to explain the total variance in the regression model, and the variance due to each predictor.*

*The study identified that higher numbers of disciplinary incidences were related to higher absenteeism rates within all student groups. Lower numbers of Hispanic student disciplinary incidences were associated with poorer student populations. In terms of facility conditions, lower numbers of Hispanic student and SWD disciplinary incidences were associated with improved cosmetic facility conditions and lower numbers of SWD disciplinary incidences were associated with improved overall facility conditions. There were no statistically significant relationships between facility conditions and overall student behavior as well as Caucasian and African American student behavior.*

## **OVERVIEW**

The average age of public-school buildings in the United States exceeded 50 years and many of these school facilities are nearing the end of their functional life span (Magzamen et al., 2017). In

a 2019 study, the US General Accounting Office identified an estimated 54% of schools nationally requiring updates or replacement of multiple school systems (US General Accounting Office, 2020) (type: "report"}, "uris": [{"http://www.mendeley.com/documents/?uuiid=ed1aeb4c-bd89-49e1-aac0-5a9cea29ae97"}], "mendeley": {"formattedCitation": "(US General Accounting Office, 2020). The US General Accounting Office (2020) estimated that heating, ventilation, and air conditioning systems needed to be updated or replaced in at least half the school buildings in 41% of school districts representing 36,000 schools nationally. The US General Accounting Office (2020) estimated percentages of school districts with at least half of schools needing update, repair, or replacement of key building systems or features that included interior lighting fixtures (28%), roofing (28%), safety and security features (27%), structural features (13%), and environmental conditions (10%).

The National Center for Educational Statistics [NCES] (2014) identified that 53% of all public schools nationally need to spend an estimated at \$197 billion on repairs, and renovations of school buildings, with an estimated average of \$4.5 million per identified school. NCES (2014) reported that 28% of schools were built prior to 1950 and 45% of schools were built between 1950 and 1969 with minor to no renovations impacting the adequacy and safety of the educational environment. Additionally, NCES (2014) established that the average building age was 44 years, renovations occurred on average 12 years ago among schools that renovated their main building, and building additions or replacement occurred on average 16 years ago. Ornstein (1994) reported that 61% of school buildings were built in the 1950s and 1960s with 20% of schools exceeding 50 years of age. Additionally, Ornstein (1994) established that school building ages between 20 to 30 years old required frequent replacement of equipment, schools between 30 and 40 years old required replacement of many original features that include roofs and electrical equipment, and school significantly deteriorated after 40 years and most were abandoned after 60 years.

### **HISTORICAL PERSPECTIVE**

Earthman et al. (1996) determined that school facility conditions influenced the perceptions of preparedness in schools, staff, students, and parents' perceptions of safety, and student achievement as well as student behavior. Facility conditions and quality affected student performance, contributed to either low or high student achievement, and had an impact on behavior (Cash, 1993). The learning environment, student academic performance, and student behavior were impacted by the building design, its appearance, and its maintenance (O'Neill & Oates, 2000). Maxwell (2016) determined that there existed a link between physical school building conditions and academic achievement, student behavior, students' perceptions of themselves, and the school's social environment. Even though family background, socioeconomic status, and school attendance could be confounding factors that affect academic performance and behavior, facility conditions could have a stronger effect on student performance (Lyons, 2001). Researchers found a positive relationship between facility conditions and grades, standardized tests, and attendance (Magzamen et al., 2017).

Building conditions influenced the perceptions of parents and staff regarding the effectiveness of the learning environment (Cash et al., 1997). Student achievement was higher in schools with better physical conditions. According to Okcu et al. (2011), academic achievement was significantly higher in math, reading, listening, and language in newer schools than in older schools, and attendance was observed to be higher in new schools. Newer buildings had reduced health problems and disciplinary actions. Educators agreed that well-maintained school buildings were essential for providing the proper learning environment; however, researchers were not able to prove a direct relationship

between building quality and its impact on student learning and behavior (Cash et al., 1997). The challenges existed in the methodology and in isolating the effects of confounding variables that commonly influence student achievement (Earthman et al., 1996; Odden & Picus, 2008).

Limited research was available to establish a relationship between building conditions and the impact on school discipline and available research was conducted more than 10 years ago. O'Neill and Oates (2000) determined that there was no significant relationship between building conditions and student behavior. Bowers and Burkett (1988), Cash (1993), and Earthman et al. (1996) identified that there was a relationship between building conditions and behavior; however, the studies presented contradicting results. Bowers and Burkett (1988) indicated that there existed a negative relationship between building conditions and behavior; that is, newer school buildings had fewer behavior issues. Earthman et al. (1996) contradicted Cash's (1993) finding that there existed a reverse negative relation between overall building conditions and behavior. That is, newer school facilities experienced higher discipline issues. However, Earthman et al. (1996) found a reverse negative relationship between structural building condition and behavior as well as a negative relationship between cosmetic building conditions and behavior. Thus, the study aimed to address the problem that poor school facility conditions appeared to negatively influence student behavior.

## **REVIEW OF LITERATURE**

Bowers and Burkett (1988) examined the relation between student learning and discipline rates and building conditions in elementary schools in rural Tennessee. The researchers conducted a study evaluating the progress of 280 fourth- and sixth graders attending two different school facilities during the 1986-1987 school year. The newer school was an elementary school housing 758 kindergarteners through eighth graders occupied in 1983-1984. The school was located on 10 acres, with fluorescent lighting, electric heat and air conditioning, acoustics controls, and a maintained color scheme with adequate furniture. The older school was another elementary school in the same school system built in 1939 with additions completed in 1950. The school housed 584 students and utilized fluorescent lighting, coal-fired furnace, several air conditioning units, and there were no evident effort to control acoustics, coordinate colors, or replace outdated furniture.

Bowers and Burkett (1988) concluded that students in the newer building had higher reading, listening, language, and arithmetic scores than students in the older building. Similarly, students in the newer building had lower discipline rates than students in the older building. Further, Bowers and Burkett (1988) determined that students attending the newer building had higher attendance rates than those attending the older building. Additionally, the study compared the illness records between both schools. The researchers determined that students experienced better attendance, better health, fewer discipline infractions, and better learning environment in schools with better physical environments.

Cash (1993) investigated the relationship between school building conditions and the influence on student academic achievement and student behavior. The study utilized an analysis of covariance, correlation, and regression to establish a relationship between school building conditions as the independent variable and student achievement and student behavior as the dependent variables. The study included the entire populations of 47 schools over 36 school divisions identified as small rural high schools in Virginia each with a senior class population less than 100 students. The researcher developed a building evaluation system that relied on school personnel to classify their building's

physical conditions. The instrument, Commonwealth Assessment of Physical Environment (CAPE), included air conditioning, heating, temperature control, lighting, equipment and furniture conditions, roof adequacy, physical features, ground conditions, and utilities and categorized them into three categories: overall, cosmetic, and structural. Building evaluators classified the physical building facility as above standard, standard, and substandard following the CAPE instrument.

Cash (1993) utilized all sub-tests of the Test of Academic Proficiency (TAP) administered to all 11<sup>th</sup>-graders in Virginia to measure student academic achievement. The researcher utilized discipline data from the Virginia Department of Education that included discipline incidents reported, and number of suspensions and expulsions. To control for confounding variables, Cash (1993) used the Virginia Composite Index to control for local wealth, and student free and reduced-price lunch data to control for socioeconomic status effects. The study conducted a mean data analysis for all building conditions ratings with free and reduced-price lunch data as a covariate.

Cash (1993) found that students in substandard school buildings performed poorly in comparison to students in standard or above standard school facilities as measured on the TAP assessment. Thus, there was a positive relationship between facilities conditions and students' academic performance. This relation held accurate in all subtests of the TAP assessment. Amongst all building rating categories, the difference in academic achievement was as much as five percentiles in all three categories with overall building ratings having the highest impacts on level of achievement compared to the cosmetic and structural categories. The study determined a reverse negative relationship between building conditions and student behavior. That is, above standard school facilities had higher discipline ratios compared to substandard school facilities. Cash (1993) explained that this relationship could be the result of stricter staff discipline practices in above standard schools than substandard schools causing higher discipline infractions reported.

Earthman et al. (1996) examined the relationship between building conditions and student academic achievement and behavior in high schools in North Dakota. Earthman et al. (1996) extended Cash's (1993) study utilizing the same methodology. The study used evaluative instruments to determine building conditions, a comprehensive test of basic skills to measure students' achievement, and recorded discipline data to classify student behavior. For a sample, the researchers examined all North Dakota high schools including 199 high schools with populations ranging from 65 to 1,200 students. The study measured student achievement using the Comprehensive Test of Basic Skills (CTBS) administered to all 11<sup>th</sup>-graders. The study received 120 responses from principals who completed evaluation instruments describing their building conditions and identified the presence or absence of select building conditions. These conditions included air conditioning, lighting, acoustics, presence of windows, cleanliness, and presence of graffiti. Similar to Cash's (1993) study, the results of the evaluation instruments ranked schools as above standard, standard, or substandard and categorized building conditions into cosmetic and structural categories.

Earthman et al. (1996) found that scores in above standard schools were higher than substandard schools in 11 out of 13 components of the CTBS assessment. When considering building cosmetics conditions, the researchers found that above standard schools outperformed substandard schools in 12 out of 13 components. Similarly, above standard schools outperformed substandard schools in 8 out of 13 components when compared to structural building conditions. The study concluded that, in 18 out of 23 categories of the evaluation instrument, overall scores of students in above standard school buildings were higher than substandard buildings.

Additionally, Earthman et al. (1996) analyzed discipline data compared to overall, structural, and cosmetic building conditions and determined that a reverse negative relationship existed between structural building conditions and behavior. However, their study determined a negative relationship between overall and cosmetic building conditions and behavior. That is, when looking at structural conditions in standard and above standard schools, students had higher disciplinary incidences compared to below standard schools, whereas overall and cosmetic building conditions in standard and above standard schools were associated with fewer discipline incidents than substandard schools.

O'Neill and Oates (2000) examined the impact of school facilities on student achievement, attendance, behavior, and teacher turnover rates in Texas middle schools. The study analyzed survey data administered to 70 middle school principals in 48 school districts in Central Texas. O'Neill and Oates (2000) concluded that school facilities had a significant impact on student achievement with school achievement being higher in newer buildings and in buildings with higher quality ratings. However, school facilities did not have a significant impact on attendance, behavior, or turnover rates. The study found that building age had the most impact on academic achievement as measured by percent pass rates on reading, mathematics, and writing assessments measured by the Texas Assessment of Academic Skills test. Furthermore, the comparison between attendance, behavior, teacher turnover, and building condition did not yield strong correlations. However, the study concluded that there was a strong cross relation between academic achievement and student attendance, behavior, and teacher turnover.

Bowers and Burkett (1988) as well as Cash (1993), Earthman et al. (1996), and O'Neill and Oates (2000) presented inconsistent and contradictory findings when describing the relationship that existed between school facility condition and behavior. Bowers and Burkett (1988) established that a negative relationship existed between building conditions and behavior. However, Cash (1993) determined that a reverse negative relationship existed between overall building conditions and behavior. Earthman et al. (1996) determined a similar relationship between structural building conditions and behavior, but contradicted that relationship when they related overall and cosmetic conditions to behavior. Even though the study findings differed, neither study identified a direct causal relationship between building conditions and student behavior.

## **PURPOSE OF THE STUDY AND RESEARCH QUESTIONS**

The purpose of the study was to examine the relationship between building conditions and overall student behavior as well as the relationship between building conditions and the behaviors of student subgroups that include Caucasian, African American, Hispanic, and Students with Disabilities (SWD). The primary research question of the study was *What is the relationship between building conditions and student behavior?* The study examined the main research question and four supporting research questions addressing behavioral impacts on student subgroups while controlling for overcrowdedness, socioeconomic status (SES), and attendance. These supporting research questions were:

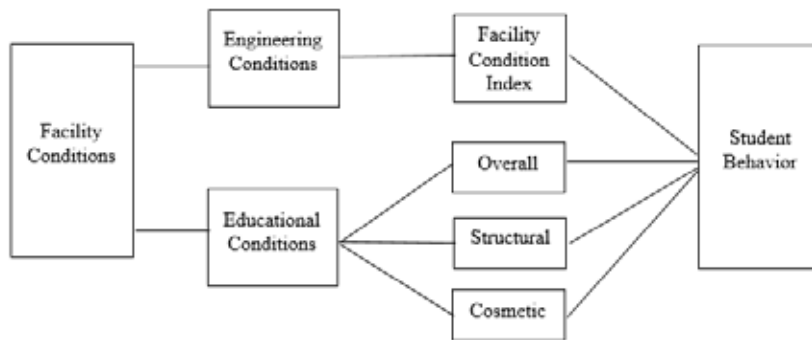
- (1) What is the relationship between building conditions and behavior of African American students?
- (2) What is the relationship between building conditions and behavior of Hispanic students?
- (3) What is the relationship between building conditions and behavior of students with disabilities?

## CONCEPTUAL FRAMEWORK

The conceptual framework (Figure 1) highlighted that potential relationship between building conditions and overall student behavior as well as the relationship between building conditions and the behaviors of Caucasian, African American, Hispanic, and SWD. Facility conditions had a potential impact on the perceptions of health, absenteeism, school culture and climate, safety, behavior, and academic performance; however, the conceptual model focused on student behavior while accounting for over-crowdedness, socioeconomic status, and attendance as mediating factors.

**Figure 1**

*Conceptual Framework*



The conceptual model suggested that facility conditions, whether engineering conditions or educational conditions, directly influenced student behavior. The direct impact of facility conditions on student achievement could come from facility engineering and maintenance conditions, overall facility conditions, structural conditions, or cosmetic conditions. While many factors could mediate the relationship between facility conditions and student behavior, controlling for over-crowdedness, socioeconomic status, and student attendance could establish a significant relationship between facility conditions and student behavior. The study examined the potential relationship between the impacts of each facility condition on student behavior and determined the possible influence of all facility conditions collectively on student behavior. The study extended the same analysis to Caucasian, African American, Hispanic, and SWD subgroups.

## METHODOLOGY

The study included data from 10 school facilities in a medium-sized school division in Virginia serving 8,515 students for the 2019-2020 academic year. These facilities included six elementary schools, two middle schools, and two high schools. The school division included 12 school facilities; however, two facilities, an alternative education facility and a career and technical center, were excluded. The alternative education school was excluded because student enrollment and discipline data were reported within the enrollment and behavior data of the students' home-schools. The career and technical center was a new facility that opened for the academic year 2021-2022 and did not have any discipline data. The 2019-2020 student population for each of the elementary schools were 688, 510, 615, 589, 786, and 711 students. Student populations of each middle school were 896, and 1,138 students and student populations of each high school were 1,170, and 1,412 students.

The study utilized two measures of building conditions: facility engineering and educational conditions. Facility engineering conditions included school elements that need to be replaced or repaired to ensure proper maintenance of the schools (Cash & Earthman, 2019). To measure facility engineering conditions, the study utilized Facility Condition Indexes (FCIs). The FCI scores provided a whole-school building indicator of school facility conditions and a suitable variable to establish relationships (Brooks & Weiler, 2018). FCI scores were defined as the ratio of the cost of repairing or replacing parts of the facility that were identified as deficient divided by the cost of replacing the entire facility (US Accountability Office, 2009). The FCI scores for each school building were obtained through the targeted school district facility condition assessment conducted for fiscal year 2019-2020 and presented to the school district in October of 2020.

To measure the facility educational conditions, the study utilized the Revised Commonwealth Assessment of Physical Environment (CAPE) developed by Cash (1993) and revised by Cash and Earthman (2019). The revised CAPE instrument addressed educational building conditions visible to students that might influence their performance academically and behaviorally (Cash, 1993; Cash & Earthman, 2019). The CAPE instrument described the overall, structural, and cosmetic conditions and provided a facility score for each. Along with the FCI scores, overall, structural, and cosmetic conditions were the predictor variables in the study representing facility conditions. Cash (1993) and Cash and Earthman (2019) completed the validation process while creating the CAPE instrument in 1993 and revising the CAPE instrument in 2019. Cash (1993) solicited the help of three facility assessment experts to review the assessment. After the initial instrument was revised, Cash (1993) field-tested the instrument with the help of eight Virginia Beach administrators in facilities with varying conditions resulting in expected facility scores. Cash and Earthman (2019) revised the CAPE instrument to measure updated facility educational conditions that were reflective of current educational needs and might impact student achievement and behavior.

The Revised CAPE instrument incorporated 23 items that included 14 structural conditions and nine (9) cosmetic conditions. The structural conditions assessed facility age, indoor air quality, windows, flooring, roof leaks, heating, air conditioning, lighting, noise conditions, presence of electrical outlets, Wi-Fi capability, and computer access. The cosmetic facility conditions assessed interior and exterior wall paint, frequency of painting, wall color, cleanliness of floors, presence of graffiti, graffiti removal, and visible ceiling material. Overall facility conditions were represented by merging structural and cosmetic facility conditions. Each CAPE item had three responses and allowed participants to select one response. The CAPE instrument assigned each item a numerical value of either 1, 2, or 3. The researchers calculated overall school facility scores by combining the scores for all 23 items. Overall facility condition scores ranged between a minimum of 23 and a maximum of 69. Similarly, structural conditions scores and cosmetic conditions scores were calculated by combining their respective item scores. Structural conditions scores ranged between a minimum of 14 and a maximum of 42. Cosmetic conditions scores ranged between a minimum of nine (9) and a maximum of 27.

The Revised CAPE instrument was administered by 10 school principals and yielded a 100% participation and completion rates. After the administration period, the researchers calculated overall, structural, and cosmetic facility scores for each school facility based on the principals' responses to the CAPE survey. Based on facility overall, structural, and cosmetic conditions, the researchers classified each facility as substandard, standard, and above standard. The researchers conducted a quartile analysis for each condition score and classified each facility into one of these

categories (Cash, 1993). Facilities with overall score falling in the lower quartile were designated substandard facilities. Facilities with overall condition scores falling within the second and third quartile ranges were classified as standard facilities. Facilities falling in the upper quartile were classified as above standard facilities. Similarly, facilities were classified as substandard, standard, and above standard based on structural conditions as well as cosmetic conditions.

Student behavior data consisted of overall discipline incidents and subgroup discipline incidents for all students attending each school facility and represented the dependent variables. Student attendance data were represented by the percent of students who were absent for at least 10% of the school year. The Virginia Department of Education (VDOE) considered students who missed at least 10% of the academic year as chronically absent (VDOE, 2021). Bowers and Burkett (1988) associated good school attendance with less discipline infractions. Since the study utilized facility FCI scores representative of the 2019-2020 facility conditions, the researchers used student behavior and attendance data for the 2019-2020 academic year for each facility identified with an FCI score. Behavior data for student subgroups that include Caucasian, African America, Hispanics, and SWD were utilized for further regression analysis. In all instances of the regression analysis, the regression model controlled for school building over-crowdedness, SES, and attendance.

Facility area, current student population, and facility capacity determined building over-crowdedness. Facility area was acquired from the targeted school division's facility assessment reports conducted in 2019-2020. Student enrollment data were collected from the Virginia Department of Education 2019-2020 School Quality Profiles. Facility capacity data were obtained through the district's capacity and utilization study conducted in the fall of 2018. Free and reduced-price lunch percentages for the 2019-2020 academic year for each school facility represented the socioeconomic status measures utilized for this study.

## **DATA ANALYSIS**

The study utilized regression and hierarchical multiple-variable regression analysis to establish possible relationships between building conditions and student behavior while controlling for over-crowdedness, socioeconomic status, and attendance. The study utilized several regression analyses to establish possible relationships between building FCI scores, overall building conditions scores, structural conditions scores, cosmetic conditions scores, and student behavior to include overall school behavior, and behaviors of students in four subgroups: Caucasian, African American, Hispanic, and SWD.

The over-crowdedness index was calculated using student 2019-2020 enrollment and school capacity. The researchers calculated behavior indexes for each school facility and each student subgroup. The behavior index reflected an incident per student ratio represented by number of discipline incidents divided by total student population. For student subgroups, the behavior index reflected total incidents for students in the student subgroup divided by total number of students in the corresponding subgroup. Similarly, the researchers utilized an overall attendance index and an attendance index for each subgroup. The overall attendance index represented the percent of students who were absent at least 10% of the school year. For each subgroup, the attendance index represented the percent of that subgroup who were absent at least 10% of the school year.

For each regression model conducted, the researchers used the perspective data associated with the model. That is, to assess the possible relationships between building conditions and student



behavior, the researchers used FCI scores, overall facility scores, structural facility scores, and cosmetic facility scores from each building, and overall behavior indexes while controlling for facility over-crowdedness, socioeconomic status, and overall attendance index. For each subgroup, the researchers utilized FCI scores, overall facility scores, structural facility scores, and cosmetic facility scores from each building since the whole building impacted all students and the behavior index for the perspective subgroup. For controls in each subgroup regression model, the researchers used the facility over-crowdedness index since over-crowdedness impacted all students and the attendance index for the perspective subgroup; however, the facility free and reduced-price lunch percentages were used with each model since free and reduced-price lunch data per subgroups were not available.

The researchers conducted individual hierarchical single-predictor regression models for each facility condition measure to establish the relationship between each building condition measure and overall student behavior while controlling for over-crowdedness, SES, and attendance. Similarly, the researchers conducted additional models to determine the impact of each building condition measure on the behavior of students in each subgroup. Additionally, the researchers conducted a hierarchical multiple-variable regression model to establish the possible influence of all facility condition measures on overall student behavior. ANOVA was utilized to explain the total variance in the regression model, and the variance due to each facility condition measure. The researchers extended the same hierarchical multiple-regression analysis to include the behaviors of student in each subgroups selected.

After conducting the ANOVA and regression analysis, the researchers identified the statistical significance of all regression models through an ANOVA analysis at a 90% and 95% confidence levels. The researchers identified the regression relationship, its statistical significance, and interpreted the statistical results to reach a conclusion for each research question. Potential relationships between building conditions and overall student behavior as well as behaviors of students in subgroups were highlighted.

## FINDINGS

### Facility Conditions and Overall Student Behavior

The researchers determined that the variation in overall student behavior was attributed to overall student attendance rather than facility conditions. When examining overall student behavior against overall student attendance, the model indicated that overall student attendance explained 60.0% of the variation in overall student behavior. The model yielded a  $p$ -value of  $0.008 < 0.05$  and was statistically significant at a 95% confidence level.

When examining overall student behavior against all control variables, the model determined that overall student attendance explained the most variation in overall student behavior followed by over-crowdedness and socioeconomic status, respectively. Overall attendance indexes uniquely explained 42.4% of the contribution in the variation within overall student behavior and were statistically significant at a 95% confidence level with a  $p$ -value of  $0.044 < 0.05$ .

When examining overall student behavior against FCI, overall, structural, and cosmetic CAPE scores independently with statistical controls, overall attendance indexes explained the majority of the contribution in the variation within overall student behavior and were statistically significant at either a 90% or 95% confidence level. Overall attendance indexes explained 32.9%-46.2% of

the variation in overall student behavior. The contribution due to FCI scores was negligible. The contributions due to overall, structural, and cosmetic CAPE scores were not statistically significant.

All models reflected a positive statistically significant relationship between overall student attendance and student behavior. Thus, as overall attendance indexes increased representing higher levels of chronic absenteeism, overall student disciplinary incidences increased.

In summary, the researchers determined that building conditions as measured by FCI, overall, structural, and cosmetic CAPE scores did not have a statistically significant impact on overall student behavior. However, the study highlighted a statistically significant positive relationship between overall attendance and overall behavior. That is, higher numbers of overall student disciplinary incidences were related to higher absenteeism rates.

### **Facility Conditions and Caucasian Student Behavior**

The researchers determined that the variation in Caucasian student behavior was attributed to Caucasian student attendance rather than facility conditions. When examining Caucasian student behavior against Caucasian student attendance, the model indicated that Caucasian student attendance explained 49.7% of the variation in Caucasian student behavior. The model yielded a  $p$ -value of  $0.023 < 0.05$  and was statistically significant at a 95% confidence level.

When examining Caucasian student behavior against all control variables, the model determined that Caucasian student attendance explained the most variation in Caucasian student behavior. Caucasian student attendance indexes uniquely explained 52.0% of the contribution in the variation within Caucasian student behavior with a  $p$ -value of  $0.033 < 0.05$  and was statistically significant at a 95% confidence level.

When examining Caucasian student behavior against FCI, overall, structural, and cosmetic CAPE scores independently with statistical controls, Caucasian student attendance indexes explained the majority of the contribution in the variation within Caucasian student behavior and were statistically significant at either a 90% or 95% confidence level. Caucasian student attendance indexes explained 37.0%-55.5% of the variation in Caucasian student behavior. The contributions due to FCI, overall, structural, and cosmetic CAPE scores were not statistically significant.

All models reflected a strong positive statistically significant relationship between Caucasian student attendance and Caucasian student behavior. Thus, as Caucasian attendance indexes increased representing higher levels of chronic absenteeism, Caucasian student disciplinary incidences increased.

In summary, the researchers determined that building conditions did not have a statistically significant impact on Caucasian student behavior. However, the study highlighted a statistically significant positive relationship between Caucasian student attendance and behavior. That is, higher numbers of Caucasian student disciplinary incidences were related to higher absenteeism rates.

### **Facility Conditions and African American Student Behavior**

The researchers determined that the variation in African American student behavior was attributed to African American student attendance rather than facility conditions. When examining African American student behavior against African American student attendance, the model indicated that

African American student attendance explained 49.6% of the variation in African American student behavior. The model yielded a  $p$ -value of  $0.023 < 0.05$  and was statistically significant at a 95% confidence level.

When examining African American student behavior against all control variables, the model indicated that all control variables explained 62.3% of the variation in African American student behavior. The model yielded a  $p$ -value of  $0.099 < 0.10$  and was statistically significant at a 90% confidence level. Additionally, the model determined that African American student attendance explained the most variation in African American student behavior followed by socioeconomic status and over-crowdedness, respectively. African American student attendance indexes uniquely explained 57.6% of the contribution in the variation within African American student behavior and were statistically significant at a 95% confidence level with a  $p$ -value of 0.023.

When examining African American student behavior against FCI, overall, structural, and cosmetic CAPE scores independently with statistical controls, African American student attendance indexes explained the majority of the contribution in the variation within African American student behavior and were statistically significant at either a 90% or 95% confidence level. African American student attendance indexes explained 48.0%-60.2% of the variation in African American student behavior. The contributions due to FCI, overall, structural, and cosmetic CAPE scores were not statistically significant.

All models reflected a strong positive statistically significant relationship between African American student attendance and African American student behavior. Thus, as the African American attendance indexes increased representing higher levels of chronic absenteeism, African American student disciplinary incidences increased.

In summary, the researchers determined that building conditions did not have a statistically significant impact on African American student behavior. However, the study highlighted a statistically significant positive relationship between African American student attendance and behavior. That is, higher numbers of African American student disciplinary incidences were related to higher absenteeism rates.

### **Facility Conditions and Hispanic Student Behavior**

The researchers determined that the variation in Hispanic student behavior was attributed to Hispanic student attendance indexes, socioeconomic status, and cosmetic CAPE scores. When examining Hispanic student behavior against Hispanic student attendance, the model indicated that Hispanic student attendance explained 35.4% of the variation in Hispanic student behavior. The model was statistically significant at a 90% confidence level with a  $p$ -value of  $0.07 < 0.10$ . Additionally, the model reflected a strong positive statistically significant relationship between Hispanic student attendance and Hispanic student behavior. That is, higher numbers of Hispanic student disciplinary incidences were related to higher absenteeism rates.

When examining Hispanic student behavior against socioeconomic status, the model indicated that student socioeconomic status explained 36.3% of the variation in Hispanic student behavior. The model was statistically significant at a 90% confidence level with a  $p$ -value of  $0.065 < 0.10$ . Additionally, the model reflected a slight negative statistically significant relationship between socioeconomic status and student behavior. Thus, as the socioeconomic status measure increased

representing poorer student populations, Hispanic student disciplinary incidences decreased. That is, lower numbers of Hispanic student disciplinary incidences were associated with poorer student populations.

When examining Hispanic student behavior against cosmetic CAPE scores with statistical controls, the overall model explained 77.8% of the variation in Hispanic student behavior. The overall model yielded a  $p$ -value of  $0.069 < 0.10$  and was statistically significant at a 90% confidence level. Further, the model determined that cosmetic CAPE scores explained the most variation in Hispanic student behavior followed by SES, Hispanic student attendance, and over-crowdedness, respectively. Cosmetic CAPE scores uniquely explained 30.6% of the contribution in the variation within Hispanic student behavior at a 95% confidence level. Socioeconomic status uniquely explained 28.7% of the variation in student behavior at a 90% significance level followed by 9.6% of the contribution explained by Hispanic student attendance. The contribution due to over-crowdedness was negligible. Further, the model reflected a slight negative relationship between cosmetic CAPE scores and Hispanic student behavior that was statistically significant at a 95% confidence level and a slight negative relationship between socioeconomic status and Hispanic student behavior that was statistically significant at a 90% confidence level. Therefore, lower numbers of Hispanic student disciplinary incidences were associated with improved cosmetic facility conditions and lower numbers of Hispanic student disciplinary incidences were associated with poorer student populations.

In summary, the researchers determined that building conditions as measured by cosmetic CAPE scores had a statistically significant impact on Hispanic student behavior. That is, lower numbers of Hispanic student disciplinary incidences were associated with improved cosmetic facility conditions. There was no statistically significant relationship due to FCI, overall, or structural CAPE scores. Further, the study reflected a strong positive statistically significant relationship between Hispanic student attendance and Hispanic student behavior. That is, higher numbers of Hispanic student disciplinary incidences were related to higher absenteeism rates. Additionally, the model supported that lower numbers of Hispanic student disciplinary incidences were associated with poorer student populations.

### **Facility Conditions and Behavior of Students with Disabilities**

The researchers determined that the variation in SWD behavior was attributed to SWD attendance indexes, overall CAPE scores, and cosmetic CAPE scores. When examining SWD behavior against SWD attendance, the model indicated that SWD attendance explained 40.9% of the variation in SWD behavior. The model yielded a  $p$ -value of  $0.046 < 0.05$  and was statistically significant at a 95% confidence level. Additionally, the model reflected a strong positive statistically significant relationship between SWD attendance and SWD behavior. Thus, as the attendance indexes increased representing higher levels of chronic absenteeism, SWD disciplinary incidences increased. Therefore, higher numbers of SWD disciplinary incidences were related to higher absenteeism rates.

When examining SWD behavior against overall CAPE scores, the model indicated that overall CAPE scores explained 33.2% of the variation in SWD behavior. The model yielded a  $p$ -value of  $0.081 < 0.10$  and was significant at a 90% confidence level. Additionally, the model reflected a slight negative statistically significant relationship between overall CAPE scores and student behavior. Thus, as the facility overall CAPE scores increased representing improved facility conditions, SWD

disciplinary incidences decreased. Therefore, lower numbers of SWD disciplinary incidences were associated with improved overall facility conditions.

When examining SWD behavior against control variables, the model determined that SWD attendance indexes explained the most variation in SWD behavior. SWD attendance uniquely explained 36.1% of the contribution in the variation within SWD behavior at a 90% confidence level with a  $p$ -value of 0.096. Additionally, the model reflected a strong positive statistically significant relationship between SWD attendance indexes and SWD behavior.

When examining SWD behavior against all facility conditions, the model determined that cosmetic CAPE scores explained the most variation in SWD behavior followed by structural CAPE scores, and FCI scores respectively. Cosmetic CAPE scores uniquely explained 35.5% of the contribution in the variation within SWD behavior at a 90% confidence level with a  $p$ -value of 0.083. Structural CAPE scores explained 19.9% of the variation within SWD behavior and FCI scores explained 16.6% of the contribution attributed to SWD behavior and did not yield statistical significance. Further, the model reflected a slight negative statistically significant relationship between cosmetic CAPE scores and SWD behavior. Therefore, lower numbers of SWD disciplinary incidences were associated with improved cosmetic facility conditions.

When examining SWD behavior against overall CAPE scores with statistical controls, the model explained 79.7% of the variation in SWD behavior. The model yielded a 90% confidence level with a  $p$ -value of  $0.056 < 0.10$ . Additionally, the model determined that overall CAPE scores explained the most variation in SWD behavior followed by SWD attendance, SES, and over-crowdedness respectively. Overall CAPE scores uniquely explained 35.6% of the contribution in the variation within SWD behavior. Overall CAPE scores yielded a 95% significance level with a  $p$ -value of  $0.032 < 0.05$ . The remaining variables did not yield statistical significance. Further, the model reflected a slight negative relationship between overall CAPE scores and SWD behavior that was statistically significant at a 95% confidence level. Therefore, lower numbers of disciplinary incidences were associated with improved overall facility conditions.

When examining SWD behavior against cosmetic CAPE scores with statistical controls, the model explained 87.5% of the variation in SWD behavior. The model yielded a  $p$ -value of  $0.018 < 0.05$  and was statistically significant at a 95% confidence level. Additionally, the model determined that cosmetic CAPE scores explained the most variation in SWD behavior followed by SWD attendance, SES, and over-crowdedness respectively. Cosmetic CAPE scores uniquely explained 43.4% of the contribution in the variation within SWD behavior at a 95% confidence level. SWD attendance uniquely explained 39.9% of the variation in behavior at a 95% confidence level. Further, the model reflected a slight negative relationship between cosmetic CAPE scores and SWD behavior that was statistically significant at a 95% confidence level as well as the strong positive relationship between SWD attendance indexes and SWD behavior. Thus, lower numbers of SWD disciplinary incidences were associated with improved cosmetic facility conditions and higher numbers of SWD disciplinary incidences were related to higher absenteeism rates.

When examining SWD behavior against all facility conditions with statistical controls, the model explained 93.3% of the variation in SWD behavior. The model yielded a  $p$ -value of  $0.070 < 0.10$  and was statistically significant at a 90% confidence level. Additionally, the model determined that cosmetic CAPE scores explained the most variation in SWD behavior followed by SWD attendance,

SES, structural CAPE scores, over-crowdedness, and FCI scores respectively. Cosmetic CAPE scores uniquely explained 47.6% of the contribution in the variation within SWD behavior at a 95% confidence level. SWD attendance uniquely explained 21.9% of the variation in student behavior at a 90% confidence level. Further, the model reflected a slight negative relationship between cosmetic CAPE scores and SWD behavior that was statistically significant at a 95% confidence level and the strong positive relationship between SWD attendance and SWD behavior that was statistically significant at a 90% confidence level. Therefore, lower numbers of SWD disciplinary incidences were associated with improved cosmetic facility conditions and higher numbers of SWD disciplinary incidences were related to higher absenteeism rates.

In summary, the researchers determined that building conditions as measured by overall and cosmetic CAPE scores had a statistically significant impact on SWD behavior. That is, lower numbers of SWD disciplinary incidences were associated with improved overall and cosmetic facility conditions. However, there was no statistically significant relationship due to FCI scores, or structural CAPE scores. Further, the study reflected a strong positive statistically significant relationship between SWD attendance and behavior. That is, higher numbers of SWD disciplinary incidences were related to higher absenteeism rates.

## **IMPLICATIONS**

**School and district leaders should include an annual cosmetic improvement plan within their facility improvement and maintenance plan to improve facility cosmetic conditions.**

The study indicated that lower numbers of Hispanic student and SWD disciplinary incidences were associated with improved cosmetic facility conditions. School and district leaders investing in improving and maintaining cosmetic facility condition could reduce Hispanic student and SWD disciplinary incidences as well as enhancing school culture and appearance for all students.

**School and district leaders should delegate cosmetic facility responsibilities to each school facilities' custodial staff.**

School and district leaders should consider providing professional development and training opportunities to custodial staff allowing them the opportunities to earn certifications in select maintenance domains; thus, they could appropriately address basic maintenance and facility cosmetic improvement needs. School districts should consider incorporating custodial training as an annual expense within the school district's fiscal budget. School and district leaders delegating cosmetic facility responsibilities to custodial staff and providing appropriate training could enhance facility cosmetic conditions; thus, decreasing student disciplinary incidences.

**School and district leaders should develop a comprehensive school-based maintenance plan that includes adequate annual funding for capital improvements and preventative maintenance needs.**

The study indicated that lower numbers of Hispanic student and SWD disciplinary incidences were associated with improved cosmetic facility conditions, and lower numbers of SWD disciplinary incidences were associated with improved overall facility conditions. School and district leaders should conduct quarterly facility conditions audits to ensure appropriate facility maintenance, check mechanical systems operations, and assess facility safety. Additionally, school and district leaders should conduct an annual audit to evaluate facility maintenance plans and determine adequacy of maintenance and improvements completed to date. School and district leaders' oversight of school

maintenance plans could enhance school facility overall and cosmetic conditions and thus decreasing Hispanic student and SWD disciplinary incidences.

**School and district leadership should ensure that students with disabilities have appropriate equal access to school facilities and educational programs.**

The study identified that lower numbers of SWD disciplinary incidences were associated with improved overall facility conditions. School and district leaders investing in upgrading and enhancing facility access could provide students with disabilities further access to educational programs and intervention to reduce SWD disciplinary incidences.

**School and district leaders should remodel self-contained classrooms and individualized program spaces to accommodate cosmetic improvements.**

The study identified that lower numbers of SWD disciplinary incidences were associated with improved cosmetic facility conditions. School and district leaders should incorporate calming wall colors, use of acoustic tiles or noise reducing panels, utilize open space design and flexible learning spaces, and increase natural light to enhance classroom cosmetic conditions. School and district leaders' implementation of these improvements could reduce SWD disciplinary incidences.

### **RECOMMENDATIONS FOR FUTURE RESEARCH**

This study was limited to one medium-sized school division in Region IV in Virginia and utilized 10 school facilities. Further, the study utilized educational facility conditions described by overall, structural, and cosmetic CAPE facility scores as well as engineering facility conditions described by FCI scores.

Due to the small sample size and weak impact of FCI scores observed in this study, future studies should consider utilizing facility educational conditions rather than facility engineering conditions to examine the relationship between educational facility conditions and student behavior. Future studies should utilize the revised CAPE instrument and include all schools in Region IV in Virginia. The expansion of the sample population will include more variation within the study data as the sample will include more diverse school districts. Further, future studies should consider analyzing the impact of school facilities on elementary school behavior, middle school behavior, and high school behavior independently as the reporting and seriousness of infractions vary within school levels. Therefore, future study findings may be generalizable across school divisions in the region.

Future studies should consider focusing on specific student subgroups. Due to the high dependence of students with disabilities on school facilities, future studies should examine the impact of educational facility conditions on the behavior of students with disabilities at the elementary, middle, and high school levels. Future studies could expand their analysis to include select at-risk student populations that include economically disadvantaged students, African American, and Hispanic students independently.

Due to the varying school disciplinary practices amongst schools and school districts, future studies should consider utilizing an instrument that assesses how behavior incidences were reported as well as assessing the school's adopted disciplinary practices and policies. This instrument could utilize a qualitative Likert scale survey as well as short response questions with the potential of holding focus groups. Thus, future studies can assess the strictness of disciplinary practices, and the types of behavior incidences documented. Further, future studies could utilize focus groups to determine

the impact of facility conditions on student behavior from a student, parent, and teacher perspective. Future studies should consider utilizing school working conditions surveys administered to staff or school climate surveys administered to students and parents to provide an overview of school climate, present behavior, safety, and bullying as well as the effectiveness and enforcement of school discipline and interventions. Therefore, future studies could mediate the impact of school climate on student behavior.

### LIMITATIONS

Even though the study described the research design, sample selection, methodology, and statistical analysis, the study had several limitations that should be recognized. These limitations included:

- The school district was composed of 12 school facilities; however, the researchers included data from 10 school facilities based on available FCI scores and behavior data. The study utilized FCI scores from the Facility Condition Assessment conducted in 2019-2020 and behavior data from the 2019-2020 academic year.
- The school facilities included in the study consisted of six elementary schools, two middle schools, and two high schools. Due to the small number of facilities at each school level, school level was not included as a factor in this study.
- The CAPE instrument required facility principals to complete the survey tool and assess the conditions of their facility. Self-surveying posed an objectivity risk and led to response bias. Participants could represent themselves in a favorable way and their responses could be biased toward what they expect to be socially desirable (Brenner & DeLamater, 2016). Self-surveying could prompt participants to select responses that were actual, ideal, or the responses that ought to be (Brenner & DeLamater, 2016).
- Since the researchers examined the relationship between building conditions and student behavior, over-crowdedness, socioeconomic status, and attendance might influence the possible relationships obtained through a hierarchical multiple-variable regression analysis.
- As a measure of student absenteeism, the researchers utilized an attendance index that reflected the percent of students absent for at least 10% of the academic year. Out-of-school suspensions were included within the reported attendance indexes. Even though the attendance indexes were used as control variables, these indexes could result in an overemphasis on student behavior incidences.
- Even though the study accounted for confounding variables, other extraneous variables might result in larger error variances and might decrease the significant correlation in the variables of interest.
- Since the study took place only in one medium-sized school division in Virginia, the study findings might not be generalizable across all medium-sized school divisions in the region or to other school districts independent of size.
- During the 2019-2020 academic year, school divisions experienced the COVID-19 pandemic and schools were closed in March 2020. Discipline and attendance data



reflected student data collected as of school closure dates. Using a cutoff date might skew the expected data for the entire 2019-2020 academic year; however, that limitation would impact all schools included in the study in the same manner.

## CONCLUSIONS

The data analysis determined that attendance was a mediating factor influencing the behavior of the overall student population as well as Caucasian, African American, Hispanic, and Students with Disabilities subgroups. Additionally, socioeconomic status was a mediating factor influencing Hispanic student behavior. In terms of facility conditions impact, overall and cosmetic facility conditions influenced student behavior. Overall CAPE scores influenced SWD behavior with statistical significance. Cosmetic CAPE scores influenced Hispanic and SWD behavior with statistical significance. However, the data analysis determined that there was no statistically significant relationship between FCI, overall, structural, and cosmetic CAPE scores and overall student behavior as well as Caucasian and African American student behavior.

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