

**Thought Question:** Does the condition of a school building *really* impact student achievement?

**Research Article:** *How Crumbling School Facilities Perpetuate Inequality*

**Subject Area:** School Infrastructure; Learning & Teaching Environments

**Authors:** Mary Filardo, Jeffrey M. Vincent, & Kevin Sullivan

**Date:** 2019

### **Summary**

The inability of schools to adequately maintain school buildings and learning environments earned K-12 schools a D+ grade from the American Society of Civil engineers when it comes to keeping up with school repairs. The average school building dates to 1968 and of those 50% require repairs. Research is clear that students are impacted by the conditions in which they learn, teachers by the conditions within which they teach, and both impact overall student achievement- ‘the evidence is unambiguous-the school building influences student health, thinking, and performance’ (p. 28). Student achievement varies between 5 to 17 percentile points between schools that are well-cared for and those that are not. Not only does the maintenance of schools impact teacher turnover and job satisfaction, but it is also directly linked to “school climate and attendance, and higher ratings of school social climate predicted lower student absenteeism, which in turn predicted higher standardized test scores” (p. 29).

Enjoy the article! **And remember...** Research is clear that positive school social climates and relationships impact student achievement. And, well-maintained schools are one key to academic success.

**Keywords:** School maintenance, school infrastructure, learning environments, teaching conditions, teacher turnover, student engagement, student achievement

# How crumbling school facilities perpetuate inequality

*Student learning is undermined in poorly designed and maintained buildings, and students from low-income families are more likely to attend school in such buildings.*

By **Mary Filardo, Jeffrey M. Vincent, and Kevin Sullivan**



*(Above) Major damage to the hallway ceiling in a school that has been inspected a number of times for water intrusion. The ceiling plaster appears to be in danger of falling, and lead paint flakes onto the floor below. (Below) Mold growth on the exterior of a musical instrument case resulting from a multiyear, recognized problem with HVAC system operation. Damage affected dozens of instruments, ceiling tiles, and pipe insulation until a major HVAC system replacement and asbestos remediation was completed.*

**W**ith Congress and the president pledging to address America’s long-term infrastructure needs, the challenges of maintaining school facilities are gaining more visibility. It is about time, too, because our public school facility infrastructure needs significant upgrading. The average public school building was built around 1968 — more than 50 years ago — and the National Center for Education Statistics reports that half of all public schools in the United States need at least one major facility repair (Alexander & Lewis, 2014). The American Society of Civil Engineers (2017) gave our public K-12 infrastructure a quality grade of D+ on their 2017 Infrastructure Report Card.

However, despite tremendous needs, many of our schools lack the funds to renovate or modernize their obsolete and crumbling facilities. The *State of Our Schools 2016* report documents a \$38-billion-per-year shortfall on capital investments for public school construction and an additional \$8-billion gap in maintenance and operations spending (Filardo, 2016). This spending gap has worsened in recent years. States and localities cut capital spending for elementary and secondary schools nationally by nearly \$21 billion, or 26%, between fiscal years 2008 and 2016, after adjusting for inflation (Leachman, 2018).

**MARY FILARDO** (mfilardo@21csf.org; @21CSF) is the founder and executive director of the 21st Century School Fund, which manages the [Re]Build America’s School Infrastructure Coalition ([www.buildUSschools.org](http://www.buildUSschools.org)), among other priorities. **JEFFREY M. VINCENT** (jvincent@berkeley.edu; @CitiesSchools) is the director of public infrastructure initiatives at the Center for Cities + Schools, University of California, Berkeley. **KEVIN SULLIVAN** (skjsully33@gmail.com; @skjsully33) is a senior adviser to the 21st Century School Fund.

## How the condition of school buildings affects education

The Office for Civil Rights at the U.S. Department of Education stated in a 2014 *Dear Colleague* letter that:

Structurally sound and well-maintained schools can help students feel supported and valued. Students are generally better able to learn and remain engaged in instruction, and teachers are better able to do their jobs, in well-maintained classrooms that are well-lit, clean, spacious, and heated and air-conditioned as needed. In contrast, when classrooms are too hot, too cold, overcrowded, dust-filled, or poorly ventilated, students and teachers suffer.

Decades of research confirm that the conditions and qualities of school facilities affect students, teachers, and overall academic achievement. In their review of the peer-reviewed literature, researchers at the Harvard School of Public Health conclude that “the evidence is unambiguous — the school building influences student health, thinking, and performance” (Eitland et al., 2017).

### **Student achievement**

A growing body of peer-reviewed research finds a relationship between school facility quality and student achievement. A 2002 review of the literature, compiled by Mark Schneider, the current director of the Institute of Education Sciences at the U.S. Department of Education, found that, on average, researchers observed a difference in student achievement between above-standard buildings and substandard buildings to be 5 to 17 percentile points. The studies cited in this review, and most studies done since, find significant correlations between poor structural, conditional, and aesthetic attributes of school buildings (including lighting, temperature and thermal comfort, acoustics, and indoor air quality) and low student learning and achievement (Earthman, 2002; Uline & Tschannen-Moran, 2008; U.S. Department of Education, Office For Civil Rights, 2014). For example, a 2004 study of 226 schools in Houston, Texas, found that poor facility quality significantly reduced daily attendance and increased drop-out rates (Branham, 2004).

Improving school facilities can have a positive effect on student performance, as found in a 2004 analysis of student achievement and indoor environmental compliance ratings in the Los Angeles Unified School District (LAUSD), led by Jack Buckley, a former director of the National Center for Education Statistics. In the study, improvements that raised a school facility’s overall environmental compliance rating from “worst” to “best” correlated to a 36-point average increase in a school’s Academic

Performance Index, a nearly 6% increase over the districtwide 2003 base (Buckley, Schneider, & Shang, 2004b). Similarly, a 2014 study by economists at the University of Chicago and Princeton University on the effect of school construction in New Haven, Connecticut, found that students moving into a rebuilt or renovated school saw strong gains (0.15 standard deviations) in reading scores (Neilson & Zimmerman, 2014). And a 2017 study of the LAUSD found that moving students out of overcrowded and degraded school facilities and into new facilities brought about gains in both standardized test scores and non-cognitive measures of educational quality (Lafortune & Schönholzer, 2017).

### **Teacher performance and satisfaction**

Researchers have also found that school facility quality affects teachers. For example, a 2002 survey of teachers in the Chicago Public Schools and the District of Columbia found that when teachers consider their school to be in poor physical condition, they are far more likely to report that they plan to leave their school or to leave teaching altogether than are teachers in facilities they consider to be in good or excellent condition (Buckley, Schneider, & Shang, 2004a). A 2017 study led by a University of Michigan environmental health researcher found that improved ventilation and indoor air quality at schools improved teachers’ self-reported job satisfaction (Batterman et al., 2017).

In short, it appears that good facility conditions can improve the teaching experience and reduce teacher turnover, while poor school conditions can hinder teachers’ work (U.S. Department of Education, 2014). In particular, teachers delivering 21st-century education and preparing students for 21st-century jobs need such physical instructional elements as science labs, technology, and special education spaces. Aging school buildings that have not been modernized often lack these important features.

## How school buildings affect health and community well-being

Substandard school buildings and grounds can negatively affect the health of children and adults in schools (Uline & Tschannen-Moran, 2008). Researchers have found that exposures to mold, poor ventilation, uncomfortable temperatures, inadequate lighting, overcrowding, and excessive noise all have potential to harm student and teacher health, contribute to absenteeism, and reduce cognitive abilities — all of which affect academic achievement (Fisk et al., 2016). Dampness and mold in school buildings exacerbate children’s and teachers’ asthma symptoms (Dangman, Bracker, & Storey, 2005), and both children and

## The average public school building was built around 1968 – more than 50 years ago – and the National Center for Education Statistics reports that half of all public schools in the United States need at least one major facility repair.

teachers perform better with increased fresh air ventilation (Myhrvold, Olsen, & Lauridsen, 1996).

Researchers and education practitioners now see school climate and positive social relations as necessary ingredients for academic achievement (Bryk & Schneider, 2002; Thapa et al., 2013), and facilities play a strong role in these areas. Properly planned, designed, and maintained school facilities promote the health, well-being, and performance of children and adults in schools and even encourage children to want to come to school (Maxwell & Schechtman, 2012). In her study of 236 New York City middle schools, Cornell University environmental psychologist Lorraine Maxwell (2016) found that school building condition is linked to school climate and attendance, and higher ratings of school social climate predicted lower student absenteeism, which in turn predicted higher standardized test scores.

### Inadequate facilities disproportionately affect the poor

Capital funding for facility infrastructure remains the most regressive element of public education finance. On average, local districts are responsible for 82% of their *capital* budget, which covers building new schools and renovating existing facilities (Filardo, 2016; National Center for Education Statistics, n.d.). In contrast, on average, local school districts are responsible for only about 45% of their annual *operating* budget, which pays for teachers, staff, administration, materials, and facility maintenance and operations. The federal government historically contributes 10% on average for local education operating costs (mainly under Title I), but it provides less than 1% of total capital expenditures by U.S. public school districts, mainly through the Federal Emergency Management Agency (FEMA) for after-the-fact disaster recovery.

Because local school districts shoulder the vast majority of their capital facilities costs, poor and low-wealth districts are frequently unable to adequately maintain their buildings and grounds, much less modernize their schools. Therefore, districts and zip codes with higher enrollments of students from low-income families are more likely to have buildings in poor condition (Alexander & Lewis, 2014; Filardo et al., 2006).

Poor communities whose school facilities need the most attention have typically received the least facility funding, as seen in a national study of more than 146,000 school facility improvement projects from 1995 to 2004, which found that the projects located in high-wealth zip codes had more than three times the capital investment than the schools in the lowest-wealth zip codes (Filardo et al., 2006). Recent studies of Texas (Rivera & Lopez, 2019) and California (Brunner & Vincent, 2018) both found that school districts with lower property values raised significantly less facility funding from local and state sources, compared to districts in areas with higher property values. These differences in funding mean that students from affluent districts are more likely to attend school in bright, comfortable, and healthy facilities, while students in poorer districts are likely to attend school in dilapidated, obsolete, and unhealthy facilities that pose substantial obstacles to learning and overall student well-being.

Further, because they lack access to capital dollars, poorer districts end up making expensive emergency and short-term repairs out of their operating budgets — thus using the money that otherwise goes to pay teachers, purchase instructional equipment, and other day-to-day educational necessities. A 2015 study by University of California, Berkeley, researchers found that this is a pervasive problem across California — districts serving low-income families spend a higher proportion of their total education budget per student on the daily upkeep, operation, and repair of their facilities than do high-wealth districts (Vincent & Jain, 2015).

Older, less well-maintained buildings are also more vulnerable when natural disasters strike, leading their students to experience more adverse effects, such as dislocation and prolonged school closures. In 2005, a total of 372,000 students were dislocated in Louisiana as a result of Hurricane Katrina, with an estimated 160,000 dislocated for months and sometimes years. According to a 2017 report by FEMA, “older school facilities are particularly vulnerable to natural disasters and in most cases school administrators do not have the financial resources to address these vulnerabilities” even though they have “a moral, and in many cases, legal responsibility to make these schools more resilient to disaster.”



(Above) A 3rd-floor classroom with damaged lead paint and plaster, long-term and unattended water intrusion, and dust/debris on surfaces — a major asthma trigger. The black security screen on the inside of the window was installed as an interim solution after a substitute teacher lost three of her fingers when a window crashed down on them.

## What can be done?

Since 1973, equity advocates have challenged the constitutionality of the education finance systems in 45 states. In many of these states, funding for school facilities has been a major component of the challenge (Center for Educational Equity, n.d.). As a result, there has been some facilities relief for low-wealth districts in Arizona, Arkansas, California, Kentucky, Ohio, New Jersey, New Mexico, West Virginia, and Wyoming. However, even with increased state funding in some states, the facility-related inequities plaguing many low-wealth students persist.

The federal government can help. It can build the capacity

of states to help local districts better plan and manage their facilities. It can also provide direct funding and other financing credits that address the annual capital budget shortfalls. Bills were introduced in the 116th Congress in January 2019 that would build state capacity and provide \$100 billion in federal funds over the next decade for states to use to fund the lowest-wealth districts and highest-need school facilities. Similar bills attracted widespread support in 2018 in the 115th Congress. Additionally, congressional Democratic leaders have pledged that school facilities funding will be included in any broad infrastructure bill.

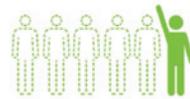
During his 2016 campaign, President Donald Trump said infrastructure was a priority, and he included schools in his vision for new investments. Meanwhile, a broad-based [Re]Build America's School Infrastructure Coalition (BASIC) has been created to advocate increased federal support. And, according to a January 2019 poll conducted by *Politico* and the Harvard T.H. Chan School of Public Health, 66% of Americans — the majority of Democrats and Republicans alike — identify federal spending on public school buildings as “extremely important.” Indeed, infrastructure is one of the few issues on which the parties seem to agree. The challenges to expanding the infrastructure table to fully include preK-12 public schools *and* seeing a comprehensive infrastructure package adequately funded are still considerable.

But public understanding of the scale, importance, and benefits of investing in public school infrastructure is increasing. That's not surprising, given that public school facilities represent the second largest sector of public infrastructure spending (after roads) and about 1 of every 6 American children and adults spend every weekday in these often-crumbling buildings. At the local level, bipartisan support for school construction and modernization is commonplace, and local communities and most states are working hard to provide healthy, safe, and educationally inspiring school buildings and grounds. In fact, at the end of fiscal year 2016, local school districts carried \$434

## K-12 public school facilities have BIG implications



**100,000**  
Public K-12 schools in U.S.



**1 in 6 Americans sets foot in a school each day**



x 2,800

**total square footage equal to 2,800 Empire State Buildings**



**2<sup>nd</sup> largest public infrastructure investment after transportation**

**SOURCE:** Filardo, M. (2016). *State of our schools: America's K-12 facilities 2016*. Washington, DC: 21st Century School Fund and Center for Green Schools.

billion in long-term debt, nearly all from borrowing to pay for facilities improvements. But local communities cannot alleviate facilities inequities without federal support. Like the rest of our nation's critical public infrastructure, public schools need targeted, stable, and sufficient funding to provide the buildings and grounds we need for our future. ■

## References

- Alexander, D. & Lewis, L. (2014). *Condition of America's public school facilities: 2012-13* (NCES 2014-022). Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- American Society of Civil Engineers. (2017). *Infrastructure report card*. Reston, VA: Author. [www.infrastructurereportcard.org/schools](http://www.infrastructurereportcard.org/schools)
- Batterman, S., Su, F.C., Waid, A., Watkins, F., Goodwin, C., & Thun, G. (2017). Ventilation rates in recently constructed U.S. school classrooms. *Indoor Air*, 27 (5), 880-890.
- Branham, D. (2004). The wise man builds his house upon the rock: The effects of inadequate school building infrastructure on student attendance. *Social Science Quarterly*, 85 (5), 1112-1128.
- Brunner, E.J. & Vincent, J.M. (2018). *Financing school facilities in California: A ten-year perspective. Getting down to facts II research report*. Palo Alto, CA: Policy Analysis for California Education & Stanford University.
- Bryk, A.S. & Schneider, B. (2002). *Trust in schools: A core resource for improvement*. New York, NY: Russell Sage Foundation.
- Buckley, J., Schneider, M., & Shang, Y. (2004a). *The effects of school facility quality on teacher retention in urban school districts*. Washington, DC: National Clearinghouse for Educational Facilities.
- Buckley, J., Schneider, M., & Shang, Y. (2004b). *Los Angeles Unified School District school facilities and academic performance*. Washington, DC: National Clearinghouse for Educational Facilities.
- Center for Educational Equity at Teachers College. (n.d.). *School funding court decisions*. New York, NY: Author. <http://schoolfunding.info/school-funding-court-decisions>
- Dangman, K.H., Bracker, A.L., & Storey, E. (2005). Work-related asthma in teachers in Connecticut: Association with chronic water damage and fungal growth in schools. *Connecticut Medicine*, 69 (1), 9-17.
- Earthman, G.I. (2002). *School facility conditions and student academic achievement*. Los Angeles, CA: UCLA's Institute for Democracy, Education, & Access.
- Eitland, E., Klingensmith, L., MacNaughton, P., Laurent, J.C., Spengler, J., Bernstein, A., & Allen, J.G. (2017). *Schools for health: Foundations for student success: How school buildings influence student health, thinking and performance*. Cambridge, MA: Harvard T.H. Chan School of Public Health.
- Federal Emergency Management Agency. (2017). *Safer, stronger, smarter: A guide to improving school natural hazard safety*. Washington, DC: Author.
- Filardo, M. (2016). *State of our schools: America's K-12 facilities 2016*. Washington, DC: 21st Century School Fund and Center for Green Schools.
- Filardo, M.W., Vincent, J.M., Sung, P., & Stein, T. (2006). *Growth and disparity: A decade of U.S. public school construction*. Washington, DC: Building Educational Success Together.
- Fisk, W.J., Paulson, J.A., Kolbe, L.J., & Barnett, C.L. (2016). Significance of the school physical environment: A commentary. *Journal of School Health*, 86 (7), 483-487.
- Lafortune, J. & Schönholzer, D. (2017). *Does new school construction impact student test scores and attendance?* Berkeley, CA: California Policy Lab, University of California.
- Leachman, M. (2018, June 25). K-12 funding cuts include capital spending to build and renovate schools [Blog post]. *Off the charts: Policy insight beyond the numbers*. Washington, DC: Center on Budget and Policy Priorities. [www.cbpp.org/blog/k-12-funding-cuts-include-capital-spending-to-build-and-renovate-schools](http://www.cbpp.org/blog/k-12-funding-cuts-include-capital-spending-to-build-and-renovate-schools)
- Maxwell, L.E. (2016). School building condition, social climate, student attendance. *Journal of Environmental Psychology*, 46, 206-216.
- Maxwell, L.E. & Schechtman, S. (2012). The role of objective and perceived school building quality in student academic outcomes and self-perception. *Children, Youth and Environments*, 22 (1), 23-51.
- Myhrvold, A.N., Olsen, E., & Lauridsen, O. (1996). Indoor environment in schools: Pupils health and performance in regard to CO2 concentrations. In *Proceedings, Indoor Air '96. The 7th International Conference on Indoor Air Quality and Climate* (Vol. 4, pp.369-371). Nagoya, Japan: International Society of Indoor Air Quality and Climate.
- National Center for Education Statistics. (n.d.). *Fast facts: Back to school statistics*. Washington, DC: U.S. Department of Education. <https://nces.ed.gov/fastfacts/display.asp?id=372>
- Neilson, C.A. & Zimmerman, S.D. (2014). The effect of school construction on test scores, school enrollment, and home prices. *Journal of Public Economics*, 120, 18-31.
- Politico & the Harvard T.H. Chan School of Public Health. (2019, January). *Americans' health and education priorities for the new Congress in 2019*. Cambridge, MA: Authors.
- Rivera, M.D. & Lopez, S.R. (2019). Some pennies are more equal than others: Inequitable school facilities investment in San Antonio, Texas. *Education Policy Analysis Archives*, 27 (16).
- Schneider, M. (2002). *Do school facilities affect academic outcomes?* Washington, DC: National Clearinghouse for Educational Facilities.
- Thapa, A., Cohen, J., Guffey, S., & Higgins-D'Allessandro, A. (2013). A review of school climate research. *Review of Educational Research*, 83 (3), 357-385.
- Uline, C. & Tschannen-Moran, M. (2008). The walls speak: The interplay of quality facilities, school climate, and student achievement. *Journal of Educational Administration*, 46 (1), 55-73
- U.S. Department of Education, Office for Civil Rights. (2014). *Dear colleague letter: Resource comparability*. Washington, DC: Author.
- Vincent, J.M. & Jain, L.S. (2015). *Going it alone: Can California's K-12 school districts adequately and equitably fund school facilities?* Berkeley, CA: Center for Cities & Schools, University of California.