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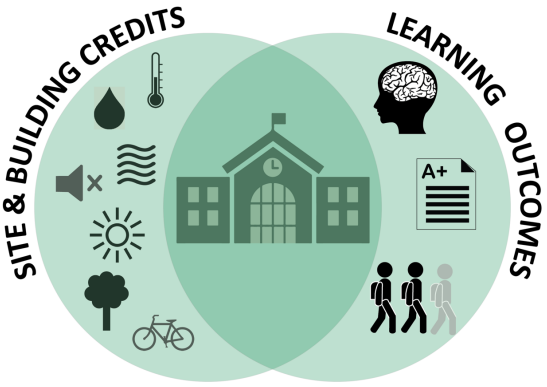
Vakalis D, Lepine C, MacLean HL, Siegel JA. 2021. Can green schools influence academic performance? *Critical Reviews in Environmental Science and Technology*, **51(13)**, 1354–1396. DOI: 10.1080/10643389.2020.1753631

Abstract

The adoption of green building certification schemes, such as Leadership in Energy and Environmental Design (LEED) for Schools, establishes common building factors among certified schools. Many building factors influence student performance outcomes including cognitive skills, standardized test scores and rates of absenteeism. This review synthesizes current research from 28 new studies and 101 other studies that were previously included in 15 reviews of associations between LEED-specified building factors and these performance outcomes in schools. In appraising the relative quantity and quality of studies, along with the frequency of LEED credits found in certified schools, this review finds that building features common to 100% of LEED-certified schools also have the strongest research supporting associations with academic outcomes, and largely come under the purview of indoor air quality (e.g., minimum ventilation rate, filtration or air cleaning) and acoustic performance. Comparatively, building factors related to the school site and daylighting have fewer associated studies, but findings suggest these are good targets for future research as they may be important for impacting student performance. Achieving a transition to a lower carbon future requires that schools be built with their energy impacts in mind; and this review provides value to those involved in the planning and design of these green schools that facilitate improved student performance outcomes.



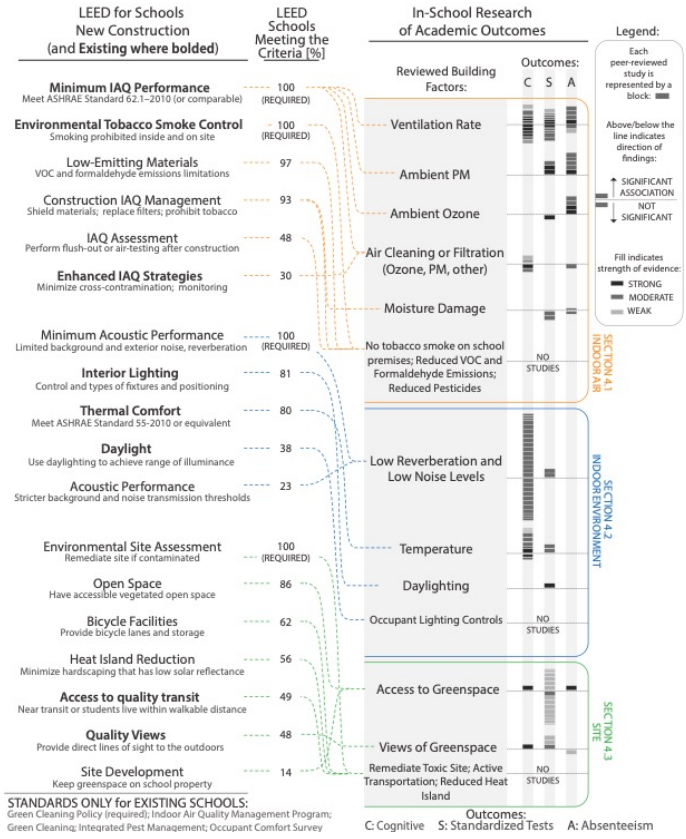


Figure 1. Graphical summary of the building criteria mapped to related investigations.

Notes: New Construction sections are found in LEED v4 for Building Design and Construction (USGBC, 2013); Existing Schools sections are found in LEED v4 for Building Operation and Maintenance (USGBC, 2014). Criteria met by 100% of schools are required, known as "prerequisites" in the LEED documentation. Outcomes: Each study occupies one shaded gray block. If the study found a statistically significant association ($p<0.05$ or 95% confidence interval >1.00) then it is placed above the dashed line; whereas if no significant association was found then it is placed below the dashed line. In this way, the height of blocks above the dashed line is proportional to the number of statistically significant findings. When one study measured multiple outcomes, e.g., speed of reaction and error-rate, then the single gray block is divided into sections, one for each outcome measured in the study. These are positioned according to statistical significance e.g., if the same study checked for association with speed of reaction and error-rate and only the first was significantly associated, then half the gray block is above the line and half below.

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