WHITE PAPER

Built to Learn

Evidence for Biophilic Design as Educational Performance Infrastructure

Executive Summary

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THE ART OF PRESERVED NATURE

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Executive Summary

A middle school math classroom in West Baltimore. Biometric sensors on the students. Five months of standardized testing. The result: students in the biophilic classroom showed test-score gains three times greater than those in the control room next door - with measurably lower stress hormone levels throughout. The building had not changed. The curriculum had not changed. The teacher had not changed. The environment had.

EEG research conducted with elementary school students confirms the neurological mechanism: real botanical material produces a significant decrease in frontal lobe theta waves - the brainwave signature associated with attention, concentration, and psychological relaxation. Artificial plants do not produce an equivalent response. The benefit is not triggered by the appearance of nature. It is triggered by authentic natural material.

The evidence for biophilic design in educational environments is not emerging. It is established. The gap is in what gets specified and in whose environments those specifications reach.

3x	$300K+	18
Test-score gains in biophilic classroom vs. control	Annual teacher turnover cost in a mid-size district	verified research sources cited

The Performance Case: What Research Actually Shows

Academic performance. Student well-being. Faculty retention. Equity. The case for biophilic design in education is not built on a single benefit - it is built on the convergence of four independently documented outcome categories, each supported by peer-reviewed research, each with a direct institutional implication.

Academic performance: Students in biophilic classrooms showed 3× greater test-score gains and biometrically verified lower stress levels across a five-month controlled study. [4]

Attentional function: EEG measurement in elementary students confirmed that real botanical material - not artificial - produces a significant decrease in frontal lobe theta waves associated with concentration and relaxation. [16]

Mental health and restoration: Students on residential campuses consistently sought nature-connected spaces for coping and stress recovery. Biophilic campus design measurably improved mental health, stress reduction, and academic engagement. [3]

Biophilic school environments: A 2024 systematic review found that nature-rich schools are associated with greater attentional performance, reduced stress, more desirable behaviors, and improved cognitive and emotional states across student populations. [1]

Teacher retention: Schools with biophilic design interventions showed improved teacher retention alongside stronger academic outcomes and reduced student absenteeism - directly impacting the $20,000-$30,000 per-departure turnover cost documented by the Learning Policy Institute. [17]

The Institutional Math: Why This Is a Financial Decision

Biophilic design in educational environments is not a wellness gesture. It is a capital allocation decision with a quantifiable return across three cost categories that every district administrator, university CFO, and facilities director already tracks.

Teacher and Faculty Retention
Teacher turnover costs educational institutions an estimated $20,000 - $30,000 per departure, creating significant financial and operational strain. Research suggests that biophilic learning environments can support faculty well-being and retention, helping schools reduce replacement costs while maintaining educational continuity.

Student Retention and Attrition
Student attrition carries substantial financial consequences through lost tuition revenue, recruitment expenses, and reduced long-term institutional value. By fostering belonging, reducing stress, and enhancing well-being, biophilic environments support many of the conditions most closely associated with student persistence and success.

Specification Risk and Remediation Cost
Selecting preserved botanical products without verified VOC testing, fire ratings, or material transparency can expose institutions to costly remediation, replacement, and compliance risks. Investing in fully documented, third-party verified solutions helps mitigate liability while supporting healthier educational environments.

The Equity Argument: Who Biophilic Design Is Most For

The schools that most need biophilic environments are most often the ones where such environments are least present. Students in under-resourced urban schools, schools in communities with elevated environmental burden, and schools operating in aging physical infrastructure face documented academic disadvantages attributable - in part - to the physical environment itself.

The Baltimore classroom study took place in an urban public charter school. The students who showed 3× greater test-score gains and measurably lower stress were students for whom the gap between their school environment and a restorative natural environment was largest. This is not an enrichment argument. It is an equity argument: biophilic design in educational contexts is a targeted environmental justice decision, not a premium amenity.

In an equity-conscious specification framework, the highest-priority biophilic investments are:

- Counseling and wellness spaces in high-need schools where restorative environment quality is most directly consequential for the most vulnerable students.
- Classroom feature walls in the highest-stress learning environments - where the evidence base is strongest and the benefit is most immediate.
- Residence hall common areas at institutions serving high proportions of first-generation students - where campus environment is often students' primary restorative resource.

Specification: Living, Faux, or Preserved - What Works in Education

Educational environments have constraints that make living plant systems impractical at scale, and that make authentic neurological benefit non-negotiable. The specification question is not aesthetic. It is operational, scientific, and institutional.

	Living Walls	Faux / Artificial	Preserved Gardens
Biophilic benefit	Authentic	None documented	√ Authentic - EEG verified
Maintenance burden	High - weekly	Low - dusting	√ Zero - no water, light, soil
School break compatibility	× Plants die unattended	√ Compatible	√ Fully compatible
Allergen risk	Pollen, mold, soil	Depends on chemicals	√ None - allergen-free
IAQ / VOC Compliance	HVAC burden	Possible off-gassing	√ CDPH tested - zero emissions
Fire rating (full system)	-	-	√ Fabricated in Fairfield, NJ
EPD published	-	-	√ Only provider in category (2026)

Garden on the Wall® - The Only Fully Verified Option

Garden on the Wall® is the pioneer and leader in preserved garden, moss wall, planter insert, and preserved draping foliage installations for commercial interiors. With 1,900+ installations across 186,000+ square feet and 60+ Fortune 500 clients - including Google, Microsoft, Amazon, Mayo Clinic, Harvard, Princeton, University of Michigan and others where material documentation is non-negotiable - GOTW brings the same verification standard to educational environments that cleared specification review in the most demanding occupied buildings in the country.

As of 2026, Garden on the Wall® is the only preserved garden provider in the United States with the complete educational specification package, independently verifiable through public registries:

√ **HPD v2.3** - whole system, 100 ppm, third-party verified
√ **CDPH VOC** - classroom scenario, whole system tested
√ **ASTM E84 Class A** - inherent to materials, no spray treatment
√ **Red List Free** - Declare Label, zero chemicals of concern
√ **ASTM D6866** - 100% bio-based carbon content verified
√ **Published EPD** - cradle-to-grave, negative cradle-to-gate carbon
√ **Buy American** - fabricated in Fairfield, NJ; public procurement compliant
√ **WBE / SBE** - certified women and small business enterprise

7-year Warranty Healthcare-grade materiality | **20+ year Lifecycle** Lowest total cost of ownership | **Zero Maintenance** No Water, light, or care required | **Complete Verification** Third-party tested & certified

Download the full white paper with complete research citations, detailed ROI calculations, and implementation guidance at gardenonthewall.com. Request samples through Material Bank · CEU available through Architectural Record's Continuing Education Center (AIA/IDCEC/GBCI accredited)