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*Research Article*

# Health & Well-Being in Architectural Education: Evidence from a Global Survey I

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## Abstract

This study presents the first systematic global analysis of health and well-being integration in architectural education, examining 345 schools across 159 countries as part of the UIA Education Commission's comprehensive survey. Employing thematic keyword analysis and content analysis, the research quantifies integration prevalence, identifies structural pathways, and reveals regional variations in pedagogical approaches. Findings demonstrate that 90 schools (26.1%) explicitly integrate health and well-being into curricula, research programs, or institutional missions, a critical threshold indicating movement from isolated innovation to emerging norm. Integration occurs through five distinct pathways: dedicated programs and specialisations (69 schools, most prevalent), research focus areas and centres (25 schools), design studio themes and projects (20 schools), cross-disciplinary collaborations (19 schools), and specific courses and modules (8 schools, least common). Regional analysis reveals striking disparities. Western Europe and Central/Eastern Europe lead with 33.3% integration rates, followed by the Americas and Asia/Oceania at 22.2%. Africa significantly lags at 16.7% with critical infrastructure gaps. Five overarching trends emerge: health transitioning from add-on to core imperative, data-driven evidence-based design methodologies, deepening interdisciplinarity through public health partnerships, contextual and climatic responsiveness, and community-centred engagement positioning students as public health interventionists. The study documents architectural education's evolution toward positioning all architects as public health agents. Yet 74% of schools show no explicit integration, indicating incomplete transformation. Findings provide evidence-based foundations for curriculum reform, accreditation standards, knowledge-sharing networks, and targeted capacity building to advance health-integrated architectural education globally, positioning health as an integrative lens connecting sustainability, equity, technology, and practice.

**Keywords:** Architectural education; Health and well-being; Curriculum integration; Pedagogical innovation; Global survey; Transdisciplinary collaboration

## Highlights

- Survey of 345 architecture schools across 159 countries documents 26.1% integration through five distinct structural pathways with stark regional disparities.
- Five global trends reveal health transitioning from specialised expertise to foundational literacy, repositioning architects as public health agents.
- Health integration catalyses curricular transformation linking contemporary imperatives while exposing critical infrastructure gaps requiring strategic knowledge exchange.

# 1 Introduction

The built environment functions as a critical determinant of human health, shaping physical vitality, mental well-being, and social cohesion (Evans, 2003; Frumkin et al., 2017). From indoor air quality affecting children's cognitive performance to neighbourhood walkability influencing cardiovascular health, architectural decisions profoundly impact population health outcomes (Altomonte et al., 2020). This recognition has prompted a fundamental reconceptualization of architecture's social responsibility, positioning spatial design as a public health intervention (Doorley et al., 2012; Jackson, 2003).

The World Health Organization's (1948) definition of health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" extends the discipline's scope beyond building codes and accessibility standards. Physical health encompasses respiratory function influenced by indoor air quality, circadian rhythm regulation affected by daylight exposure, and cardiovascular fitness enabled by active design (Allen et al., 2016; Sallis et al., 2004). Mental health includes stress reduction through biophilic design and cognitive restoration via nature access (Kaplan, 1995; Ulrich, 1984). Social well-being involves community cohesion facilitated by public space design and civic engagement fostered through inclusive environments (Gehl, 2011; Talen, 1999).

Substantial evidence now links specific design strategies to measurable health outcomes. Indoor environmental quality directly affects occupant health, productivity, and satisfaction (Altomonte et al., 2020; Fisk, 2000). Biophilic design elements enhance psychological well-being and accelerate healing (Kellert et al., 2008; Nieberler-Walker et al.,2025; Stevens et al., 2019). Urban form characteristics influence physical activity patterns and chronic disease prevalence (Ewing & Cervero, 2010; Jackson, 2003). Universal design principles function as health equity interventions enabling full participation (Imrie & Hall, 2001; Steinfeld & Maisel, 2012).

This evidence positions architects as public health representatives whose decisions cascade through communities and generations (Frumkin et al., 2017). School design affects childhood development (Heschong et al., 2002). Neighbourhood planning influences obesity and diabetes rates (Sallis et al., 2004). Housing configuration is associated with social isolation among elderly residents (Gehl, 2011). Yet integration of this expanded health mandate into architectural education, where future practitioners develop values, knowledge, and competencies, remains poorly understood and unevenly implemented globally.

## 1.1 Study Positioning and Objectives

Contemporary architectural education faces an imperative to shift health and well-being from peripheral electives to foundational design lenses (Bozkurt, 2016; Shepley et al., 2012) woven through the curricula. The recognition that "designing buildings is no longer enough" reflects a broader disciplinary transformation: architects must design for human flourishing, not merely shelter (Stevens et al., 2019). This transformation aligns with parallel imperatives in sustainability and equity, requiring epistemological reorientation (Petermans & Pohlmeyer, 2014). Students must evaluate design decisions through health outcome metrics, demanding interdisciplinary fluency in environmental psychology, building science, public health, and community engagement (Corburn, 2009).

This paper constitutes the inaugural study in a six-paper thematic series examining cross-cutting transformations in global architectural education, based on the UIA Architecture Education Commission's survey of 345 schools across 159 countries (Patil et al., 2025; UIA Architecture Education Commission, 2025). Health and well-being emerge as one of six cross-cutting themes alongside transdisciplinary curriculum, decolonising pedagogy, SDG integration, AI transformation, and allied disciplines. Health integration inherently involves sustainability (environmental quality), equity (universal design), technology (sensor-driven monitoring), transdisciplinarity (public health partnerships), and practice (post-occupancy evaluation).

The study addresses three objectives: (1) Quantify the extent of explicit health and well-being integration globally and regionally across five UIA regions: Western Europe, Central/Eastern Europe, the Americas, Asia/Oceania, and Africa. (2) Identify and characterise pathways through which schools integrate health and well-being, such as dedicated programs and specialisations, specific courses and modules, design studio themes and projects, research focus areas and centres, and cross-disciplinary collaborations. (3) Analyse regional variations and innovation patterns, identifying exemplars and persistent gaps, particularly resource constraints and capacity limitations in underrepresented regions. The findings provide evidence-based foundations for curriculum reform, accreditation standards, and targeted capacity building.

### 1.2 Research Significance

No comprehensive global mapping has documented the extent of health and well-being integration, pathways, or regional variations in architectural education. This knowledge gap has significant implications. Without understanding current integration patterns, educational institutions lack evidence-based models for curriculum reform. Accreditation bodies cannot establish appropriate standards. Professional organisations cannot target capacity-building efforts. Students may graduate unprepared to address the health dimensions of contemporary practice.

This study provides the empirical foundation necessary for evidence-based educational transformation. By documenting the paradigm shift from health as specialised expertise to foundational literacy, the research positions health as an integrative lens connecting contemporary architectural education's most pressing imperatives. Health operationalises sustainability through healthy materials and energy-efficient thermal comfort systems (Kellert et al., 2008; Kujundzic et al., 2023). Health manifests equity through universal design and informal settlement interventions (Steinfeld & Maisel, 2012; Watson, 2009). Health drives technological competency through sensor-driven monitoring and building performance modelling (Altomonte et al., 2020; Preiser & Vischer, 2005). This integrative capacity provides a transferable framework for comprehensive curriculum transformation, addressing other cross-cutting themes examined in the UIA survey series.

## 2 Literature Review: Evolution of Health Management in Architecture

Understanding how architectural education integrates health and well-being requires contextualising within the broader evolution of how the discipline has conceptualised and managed health over time. This literature review traces architecture's expanding engagement with health across four distinct periods, revealing a trajectory from narrow engineering-based environmental control to comprehensive well-being frameworks integrating physical, mental, and social dimensions. The chronological analysis demonstrates how research evidence, professional practice, and institutional frameworks have progressively positioned health as a fundamental design imperative, yet reveals persistent gaps in translating this knowledge into educational practice, the critical void this study addresses.

### 2.1 Pre-1990s: The Engineering Paradigm- Controlling the Physical Environment

Prior to the 1990s, architecture managed health primarily as an engineering problem focusing on environmental control, sanitation, and disease prevention. This approach emerged from 19th-century public health crises, such as cholera epidemics, tuberculosis outbreaks, and industrial pollution, which positioned architects as agents of hygiene reform (Hamlin, 1998; Porter, 1999). The miasma theory (the old idea that diseases spread through “bad air” from rotting matter and foul-smelling environments), though scientifically flawed, profoundly shaped architectural thinking, which held that health required maximum sunlight penetration, cross-ventilation, and impermeable surfaces that could be sanitised (Campbell, 2005; Mitman, 2007).

Modernist architecture internalised these principles, with Le Corbusier's (1923) "machine for living" manifesto emphasising light, air, and cleanliness as non-negotiable design imperatives. Banham's

(1969) comprehensive history positioned environmental control systems, including heat, ventilation, and lighting, as architecture's primary contribution to health, though this framing was narrow and grounded in mechanical engineering rather than holistic well-being. The discipline developed sophisticated environmental control methodologies, exemplified by Fanger's (1970) thermal comfort equations, which reduced human physiological responses to mathematical formulas predicting mean vote and the predicted percentage dissatisfied. These models, now embedded in building codes worldwide (ASHRAE, 2013), treated occupants as passive subjects requiring environmental stabilisation rather than active agents with diverse preferences and adaptive capacities.

During this era, health remained implicit rather than explicitly addressed through prescriptive building codes mandating minimum ventilation rates, structural safety factors, egress widths, and basic accessibility features. Architecture managed health by preventing harm (avoiding toxic materials, ensuring structural stability, providing emergency exits) rather than actively promoting well-being. Healthcare facility design emerged as a specialised practice (Verderber, 2010), but this reinforced health as a niche expertise for hospital architects rather than foundational literacy for all practitioners. Architectural education during this period rarely included explicit health content beyond building codes and environmental systems, treating health as a byproduct of good design rather than a primary design objective.

## 2.2 1990-2000: Expanding Beyond Engineering- Indoor Environmental Quality and Psychological Well-Being

The 1990s witnessed paradigm expansion as architecture began managing health through evidence-based understanding of building-occupant interactions. Architecture confronted the reality that mechanically controlled buildings were making occupants ill. "Sick building syndrome" emerged as a legitimate health concern (Mendell, 1993), with research demonstrating that ventilation rates directly affected health and productivity (Fisk & Rosenfeld, 1997; Wargocki et al., 2000). Design thinking shifted from code compliance to performance optimisation. Simultaneously, architecture rediscovered natural light as a health intervention beyond energy efficiency. Studies demonstrated daylighting improved occupant satisfaction and productivity (Boyce et al., 2003), while circadian rhythm research revealed lighting affected sleep quality and mood (Webb, 2006). Health management now includes strategic window placement and interior planning, maximising daylight penetration (Ulrich et al., 1991).

Perhaps most transformatively, architecture began managing psychological and emotional health through spatial design. Kaplan and Kaplan's (1989) attention restoration theory demonstrated that natural settings restored cognitive resources and reduced mental fatigue. Ulrich's landmark studies proved that views of nature accelerated surgical recovery (1984) and triggered measurable physiological stress reduction (Ulrich et al., 1991). Architecture became a therapeutic intervention. Healthcare architecture pioneered systematic evidence accumulation linking design decisions to clinical outcomes, such as single-bed rooms reduced infections, appropriate noise levels improved sleep quality and recovery times, wayfinding clarity decreased anxiety (Rubin et al., 1998). This methodology provided replicable frameworks for decision-making grounded in measured outcomes rather than aesthetic intuition.

The decade also reframed accessibility as proactive health promotion. Universal design principles (Mace et al., 1991) positioned inclusive environments as enabling full participation across diverse abilities. Transportation research demonstrated urban design decisions profoundly affected physical activity patterns (Cervero & Gorham, 1995; Frank & Pivo, 1994), extending health management from individual buildings to urban systems. By decade's end, architecture expanded health management from environmental control to a multidimensional framework encompassing indoor environmental quality, psychological restoration, clinical outcomes, inclusive design, and urban systems, with post-occupancy evaluation and environmental monitoring measuring health impacts (Evans & McCoy, 1998).

## 2.3 2001-2010: Institutionalisation- Evidence-Based Design and Biophilic Design Movements

The 2000s transformed health management through systematic evidence accumulation and institutional frameworks standardising health-centred approaches. Ulrich et al.'s (2008) comprehensive synthesis established evidence-based design as a rigorous methodology linking interventions to measurable outcomes, such as single-bed rooms reduced infections 50%, and appropriate lighting decreased medication errors 30%. Hamilton and Watkins (2009) extended evidence-based design beyond healthcare, while Zimring and Bosch (2008) developed frameworks enabling meta-analyses. In specialised practice, architecture now manages health through systematised knowledge accumulation borrowed from medical research.

Simultaneously, Kellert et al.'s (2008) biophilic design synthesis demonstrated nature contact triggered measurable health benefits, reduced stress hormones, improved cognitive performance, and enhanced immune function. Heerwagen (2009) applied principles to urban design, positioning nature integration as an evidence-based health intervention. Research revealed indoor environmental quality profoundly affected cognitive performance, with CO2 concentrations impairing decision-making at 1,000 ppm (Satish et al., 2012) and poor ventilation reducing complex tasks 50% (Wargocki et al., 2000). Heschong et al.'s (2002) school studies showed abundant daylight accelerated learning by 20-26%.

At the urban scale, Ewing and Cervero's (2010) meta-analysis established the "5Ds" framework, with well-designed neighbourhoods generating 45% more walking trips. Jackson (2003) positioned the built environment as a legitimate public health domain, while Steinfeld and Maisel's (2012) framework demonstrated that inclusive design enabled ageing-in-place. Corburn (2009) synthesised architecture, planning, and public health into a "healthy cities" approach. Professional organisations, certification systems (LEED health credits, WELL precursor), and research centres established supporting infrastructure, though educational integration remained inconsistent.

## 2.4 2011-2025: Holistic Well-Being, Climate-Health Nexus, and Pandemic Resilience

The current era demonstrates architecture managing health through comprehensive frameworks integrating physical, mental, and social dimensions while responding to climate change, pandemics, and inequities. Altomonte et al.'s (2020) synthesis positioned well-being as a fundamental design imperative spanning environmental quality, spatial experience, and social connectivity. Allen et al.'s (2016) Harvard study demonstrated that office environments affected cognitive function, physical comfort, and social interaction simultaneously, with optimal conditions improving complex reasoning 101%. Architecture manages holistic well-being through multi-objective optimisation, balancing thermal comfort, air quality, acoustics, lighting, spatial layout, biophilic elements, and social infrastructure.

Kellert's (2018) synthesis demonstrated measurable mental health benefits from nature integration, while Allen and Macomber (2022) positioned mental health support as a business imperative. Architecture now manages mental health through evidence-based strategies: biophilic elements reducing cortisol levels 12-15%, acoustic interventions improving concentration and reducing stress-related absenteeism 27%, and daylighting regulating circadian rhythms. Climate change simultaneously repositioned architecture as critical adaptation infrastructure, with urban heat islands exacerbating mortality (Stone et al., 2014) and air pollution causing respiratory disease (Patz et al., 2014). Architecture manages climate-related health through passive cooling, green infrastructure, and climate-responsive envelopes, integrating health with sustainability as a unified imperative.

COVID-19 transformed infectious disease management through ventilation strategies, spatial configuration, and material selection (Megahed & Ghoneim, 2020; Dietz et al., 2020). Architecture shifted from passive background to active health infrastructure through increased ventilation rates,

High-Efficiency Particulate Air (HEPA) filtration, flexible layouts enabling distancing, and optimised natural ventilation. Research documented persistent health disparities, substandard housing causing respiratory disease in low-income communities (Hood, 2005), and inadequate green space, concentrating heat exposure among marginalised populations. Architecture manages health equity through affordable housing, prioritising indoor environmental quality, inclusive design, and participatory processes, positioning architects as health equity interventionists.

The WELL Building Standard established comprehensive requirements transforming health from an aspirational goal to a measurable standard. Post-occupancy evaluation methodologies have matured (Preiser & Vischer, 2005), creating accountability feedback loops through health impact assessments, sensor-driven monitoring, and continuous commissioning. Despite extensive research and professional frameworks, integration into architectural education remains incomplete and geographically uneven, the critical gap this study addresses.

## 2.5 Knowledge Gaps and Study Positioning

Existing literature extensively documents design-health relationships and develops evidence-based methodologies across multiple domains, including indoor environmental quality, biophilic design, evidence-based design, universal design, active urban design, and climate-health integration. Yet virtually no research systematically examines how architectural education integrates this knowledge globally. Previous education studies focus on single institutions (Shepley et al., 2016), specific pedagogies (Bozkurt, 2016), or lack comparative cross-regional analysis. This study addresses this critical gap by providing the first comprehensive global mapping of health integration in architectural education, revealing regional disparities, identifying integration pathways, and establishing evidence-based foundations for curriculum reform.

The literature on architectural pedagogy and curriculum reform provides an important additional frame for understanding this gap. Scholars examining disciplinary curriculum transformation have documented that integrating new knowledge domains into established professional programmes typically occurs through identifiable stages, from optional electives to embedded modules to core competency requirements, often catalysed by accreditation reform and professional body advocacy (Boyer & Mitgang, 1996; Salama, 2015). Within architectural education specifically, parallel integration trajectories are visible in sustainability and digital technology. Salama and Wilkinson (2007) documented how environmental design shifted from optional enrichment to core requirement across programmes in multiple regions, while more recent scholarship on computational design traces a similar pattern of diffusion from pioneering adopters to mainstream integration. Health and well-being integration appears to follow an analogous but earlier-stage trajectory, making pedagogical literature on these comparable reform cycles directly relevant to interpreting the present study's findings.

*Table 1: Evolution of Health Management in Architecture-Key References by Period.*

| Author(s) & Year | Core Concept | Health Management Approach |
|---|---|---|
| **PRE-1990s: Engineering Paradigm** | | |
| Le Corbusier (1923) | Modernist manifesto | Light, air, and cleanliness as design imperatives |
| Banham (1969) | Environmental systems | Mechanical environmental control |
| Fanger (1970) | Thermal comfort models | Quantified physiological response to the environment |
| Hamlin (1998) | Public health history | Sanitation and disease prevention |
| Campbell (2005) | Tuberculosis architecture | Disease-specific spatial design |
| Verderber (2010) | Healthcare architecture | Specialised health facility design |
| **1990-2000: Expanding Beyond Engineering** | | |
| Kaplan & Kaplan (1989) | Attention restoration theory | Psychological restoration through nature |
| Mace et al. (1991) | Universal design principles | Inclusive design as health equity |
| Mendell (1993) | Sick building syndrome | Indoor environmental quality as a health concern |
| Steinfeld & Shea (1993) | Enabling home environments | Housing adaptations for ageing and disability |
| Frank & Pivo (1994) | Mixed-use density | Neighbourhood design and walking behaviour |
| Cervero & Gorham (1995) | Transit neighborhoods | Urban form and transportation mode choice |
| Fisk & Rosenfeld (1997) | Productivity economics | Health-productivity linkage |
| Evans & McCoy (1998) | Built environment psychology | Multidimensional framework connecting design to health |

| | | |
|---|---|---|
| Rubin et al. (1998) | Healthcare design evidence | Design-clinical outcome relationships |
| Wargocki et al. (2000) | Ventilation research | Air quality impacts on health and performance |
| Boyce et al. (2003) | Daylighting quality | Natural light and occupant satisfaction |
| Webb (2006) | Non-visual lighting effects | Circadian rhythm and lighting |
| **2001-2010: Institutionalisation** | | |
| Heschong et al. (2002) | Daylighting in schools | Natural light and learning performance |
| Jackson (2003) | Built environment as public health | Legitimising the architecture-health field |
| Preiser & Vischer (2005) | Building performance assessment | Post-occupancy evaluation frameworks |
| Ulrich et al. (2008) | Evidence-based design synthesis | Systematic design-health evidence accumulation |
| Kellert et al. (2008) | Biophilic design framework | Nature integration as a health intervention |
| Zimring & Bosch (2008) | EBD methodology | Research protocols for design-health studies |
| Corburn (2009) | Healthy cities integration | Architecture-planning-public health collaboration |
| Hamilton & Watkins (2009) | EBD across building types | Evidence-based design beyond healthcare |
| Heerwagen (2009) | Urban biophilia | Biophilic principles in urban design |
| Ewing & Cervero (2010) | Built environment meta-analysis | "5Ds" framework for walkability |
| Satish et al. (2012) | CO2 cognitive impacts | Indoor air quality and decision-making |
| Steinfeld & Maisel (2012) | Universal design comprehensive | Inclusive design across the lifespan |
| **2011-2025: Holistic Well-Being** | | |
| Patz et al. (2014) | Climate-health nexus | Built environment climate adaptation |
| Stone et al. (2014) | Urban heat health impacts | Heat island mitigation strategies |
| Allen et al. (2016) | Cognitive function research | IEQ impacts on complex reasoning |
| Kellert (2018) | Biophilic design practice | Mental health benefits of nature |
| Altomonte et al. (2020) | Holistic well-being framework | Integrated physical-mental-social health |
| Dietz et al. (2020) | Infectious disease control | Spatial design for pathogen reduction |
| Megahed & Ghoneim (2020) | COVID-19 built environment | Pandemic architectural response |
| Allen & Macomber (2022) | Healthy Buildings Business Case | Mental health as a productivity imperative |

# 3 Methodology

This study employs a mixed-methods approach, combining quantitative prevalence analysis with qualitative pathway characterisation, to map the integration of health and well-being across global architectural education. The methodology unfolds through four sequential stages illustrated in Figure 2: (1) School Selection Strategy utilising ranked and non-ranked databases, (2) Data Collection from institutional sources, (3) Content Analysis employing statistical and thematic approaches, and (4) Health and Well-Being Framework development, identifying regional patterns, integration pathways, and overarching trends (Figure 1). Drawing from the UIA Education Commission's comprehensive survey of 345 schools across 159 countries, this multi-layered analytical framework enables both systematic measurement of integration prevalence and nuanced understanding of how institutions operationalise health-centred curricula, research programs, and collaborative structures across diverse educational contexts.

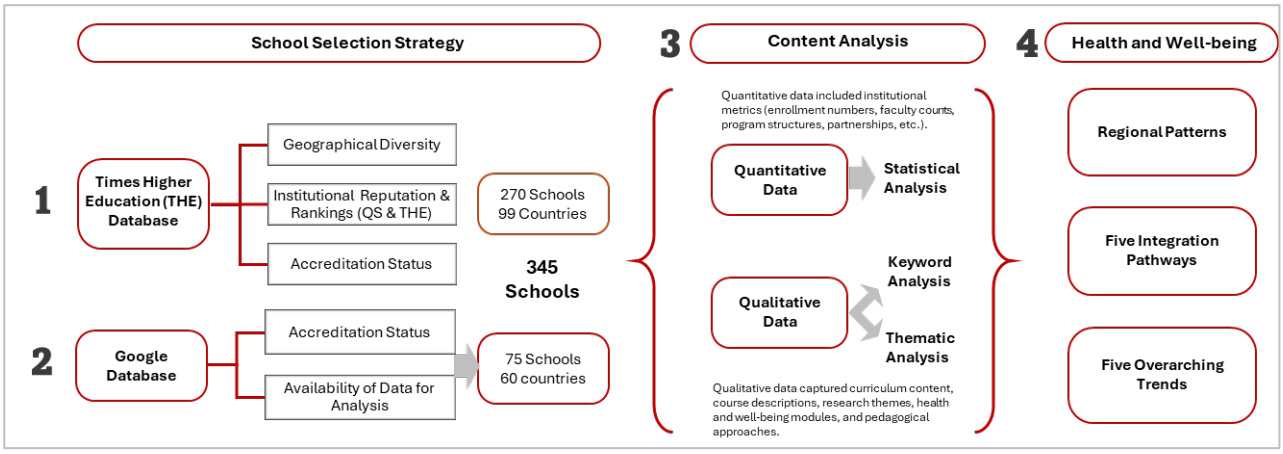


*Figure 1. Four-stage methodological framework for analysing health and well-being integration across 345 architecture schools globally.*

## 3.1 Stage 1 & 2: School Selection Strategy

School selection employed a two-stage strategy ensuring global representation, academic credibility, and data accessibility, yielding a final sample of 345 architecture schools across 159 countries.

*Stage 1: Times Higher Education (THE) Database (270 schools from 99 countries):* The first stage utilized QS World University Rankings and Times Higher Education (THE) rankings to identify schools based on three criteria: (1) geographical diversity ensuring representation across all UIA regions, (2) institutional reputation and rankings (QS & THE) with proportional representation across ranking tiers (top 50, 51-200, 201-1000), and (3) accreditation status verified through national and international bodies. This stage selected 2-5 schools per country, depending on institutional density, establishing the core sample of highly ranked institutions with robust public documentation.

*Stage 2: Google Database (75 schools from 60 countries):* The second stage addressed underrepresentation in Africa, Central Asia, and Latin America by identifying additional schools through web searches and accreditation databases. Selection criteria included: (1) accreditation status verified through national bodies, the Commonwealth Association of Architects, and regional professional organisations, and (2) availability of data for analysis through accessible institutional websites and documentation. This deliberate oversampling of underrepresented regions ensured the final 345-school sample represented diverse institutional types, geographic contexts, and resource environments beyond elite global rankings.

## 3.2 Data Collection

Data collection occurred from February 2025 to June 2025, utilising multiple sources systematically extracted into a structured database, enabling both quantitative and qualitative analysis.

*Quantitative Data Sources:* Institutional metrics (enrollment numbers, faculty counts, program structures, partnerships) were extracted from THE World University Rankings, QS World University Rankings by Subject (Architecture/Built Environment), and national/regional accreditation databases (NAAB, RIBA, CAA). These sources supplied standardised information on institutional characteristics, including size, research intensity, international diversity, and accreditation status, contextualising integration patterns.

*Qualitative Data Sources:* Curriculum content, course descriptions, research themes, health and well-being modules, and pedagogical approaches were captured through official university websites, program descriptions, course catalogues, institutional reports, research centre websites, and accreditation self-studies. Data were systematically extracted into a structured database with fields for institutional characteristics, program structure, curriculum content, research infrastructure, partnerships, and faculty expertise.

*Data Limitations:* Limitations include institutional transparency variations constraining analysis to publicly available information, language barriers affecting non-English sources, self-reported documentation potentially overstating integration, a temporal snapshot (February-June 2025) in a rapidly evolving field, and keyword analysis potentially underdetecting implicit integration where health principles are embedded without explicit terminology.

## 3.3 Stage 3: Content Analysis

Content analysis employed dual analytical approaches combining quantitative statistical analysis with qualitative keyword and thematic analysis to identify health integration patterns.

*Quantitative Data- Statistical Analysis:* Statistical analysis quantified integration prevalence across institutions, regions, and pathways. Descriptive statistics calculated percentages of schools integrating health by region, pathway type, and institutional characteristics. Cross-tabulation revealed relationships between integration patterns and variables, including ranking tier, geographic location,

and institutional size. This quantitative foundation established baseline integration rates (26.1% global integration) and regional disparities (ranging from 33.3% in Regions I and II to 16.7% in Region V).

*Qualitative Data- Keyword Analysis:* Keyword analysis employed a hierarchical taxonomy across three tiers to systematically identify schools explicitly addressing health: (1) Primary keywords identifying direct health terminology ("health," "well-being," "wellness," "healthy building," "public health," "therapeutic," "healing"), (2) Secondary keywords capturing specific domains ("indoor air quality," "thermal comfort," "biophilic design," "universal design," "post-occupancy evaluation," "building performance," "environmental psychology"), and (3) Tertiary keywords identifying related concepts ("healthy cities," "active design," "walkability," "mental health," "environmental health"). The protocol was systematically applied to curriculum descriptions, course catalogs, research center pages, and faculty profiles for all 345 schools, with synonym mapping addressing linguistic variations. Of 42 keywords searched, 21 appeared across institutional materials, generating 251 total mentions and detecting 90 schools (18.7%) with explicit health terminology.

*Qualitative Data- Thematic Analysis:* Thematic analysis involved systematically reviewing curriculum structures, program descriptions, research activities, and collaborative arrangements across all integrating schools. Through iterative analysis, five distinct integration pathways emerged inductively: (1) dedicated programs and specialisations (e.g., MSc in Healthcare Architecture), (2) research focus areas and centres (e.g., dedicated labs studying design-health relationships), (3) design studio themes and projects (e.g., studios focused on healing environments), (4) cross-disciplinary collaborations (e.g., joint programs with public health faculties), and (5) specific courses and modules (e.g., standalone electives on healthy environments). Framework validity was established through pilot testing on 30 schools, inter-rater reliability checks across three researchers (Cohen's kappa = 0.87, indicating strong agreement), and member checking with UIA Education Commission members.

## 3.4 Stage 4: Health and Well-Being Framework Development

The final analytical stage synthesised findings into a comprehensive framework with three interconnected components identifying regional patterns, structural pathways, and conceptual trends (Figure 2).

*Regional Patterns:* Regional analysis employed a comparative case study methodology, quantifying schools and specific pathways within each region while qualitatively assessing regional characteristics and contextual factors influencing integration. This dual quantitative-qualitative approach identified both prevalence patterns (90 integrating schools distributed across five UIA regions) and contextual dynamics shaping regional variations, revealing striking disparities from Western Europe's 33.3% integration to Africa's 16.7%.

*Five Integration Pathways:* The five inductively derived pathways include dedicated programs (69 schools, 76.7%), research centers (25 schools, 27.8%), design studios (20 schools, 22.2%), cross-disciplinary collaborations (19 schools, 21.1%), and courses/modules (8 schools, 8.9%) characterize structural mechanisms through which institutions operationalise health integration. Regional distribution of each pathway reveals geographic concentrations: Western Europe leads in dedicated programs (36.2%), Asia/Oceania in research centres (32%) and collaborations (36.8%), while standalone courses remain scarce globally (2.3% of all schools).

*Five Overarching Trends:* Synthesis across 90 integrating schools identified five global trends transcending regional and pathway differences: (1) health transitioning from add-on to core imperative, (2) data-driven evidence-based design methodologies, (3) deepening interdisciplinarity through public health partnerships, (4) contextual and climatic responsiveness, and (5) community-centred engagement. These trends represent conceptual shifts in how architectural education conceptualises health's role, distinct from the structural pathways through which integration occurs. Each trend was validated through multiple institutional examples demonstrating consistent patterns across diverse geographic and resource contexts.

This four-stage methodology, from school selection through framework development, provides a comprehensive, systematic understanding of health integration's current state while identifying strategic opportunities for advancement across diverse institutional contexts.

# 4 Findings

This section presents findings from the comprehensive analysis of 345 architecture schools across 159 countries, revealing patterns of health and well-being integration in contemporary architectural education. The analysis unfolds through three interconnected components: (1) global integration landscape establishing baseline prevalence and keyword validation, (2) five distinct integration pathways characterising structural mechanisms through which schools operationalise health-centred curricula, and (3) five overarching trends representing conceptual shifts transcending regional and institutional differences. Findings draw from systematic keyword analysis of institutional materials, thematic analysis of curriculum structures and research activities, and comparative regional assessment, revealing striking geographic disparities. Together, these components map how architectural education worldwide is responding to imperatives for health literacy, demonstrating both significant momentum in leading institutions and persistent gaps requiring strategic intervention.

## 4.1 Global Integration Landscape and regional patterns

The global survey reveals that 90 of 345 architecture schools (26.1%) explicitly integrate health and well-being into curricula, research programs, or institutional missions, a critical threshold establishing health-integrated design as an emerging norm rather than an isolated innovation yet indicating three-quarters of institutions have not made this pedagogical shift explicit (Figure 2).

Systematic keyword analysis across twelve text-rich fields reveals critical patterns in how schools articulate health integration (Figure 3). The dominance of broad terms such as “health," "well-being," and "building performance" suggests institutions frame health through holistic wellness concepts rather than technical specifications. This linguistic choice may indicate pedagogical emphasis on comprehensive well-being frameworks over narrow environmental control, aligning with the literature review's documented evolution from engineering paradigms to holistic approaches. However, the complete absence of critical technical terms, "indoor air quality," "acoustic comfort," "mental health", signals a troubling articulation gap: schools may be teaching these concepts without naming them explicitly in public-facing materials, or alternatively, these evidence-based domains remain under integrated despite extensive research establishing their health impacts. The prevalence of secondary keywords, "accessibility," "inclusive design," "post-occupancy evaluation", reveals a significant finding: schools integrate health indirectly through universal design and evidence-based methodologies rather than explicit health framings, suggesting diffusion occurs through adjacent disciplinary frameworks (equity, performance assessment) before crystallising as health-specific content. The 8-percentage-point discrepancy between keyword detection (18.7%) and manual classification (26.1%) confirms that meaningful integration often operates through practice-oriented structures, studios, research centres, and interdisciplinary collaborations that resist keyword capture, validating the necessity of mixed-methods analysis combining automated detection with qualitative pathway assessment (UIA Architecture Education Commission, 2025).

Regional distribution demonstrates striking variations reflecting distinct trajectories in translating research into pedagogy (Figure 4). Region I (Western Europe) leads with 30 schools (33.3% of regional schools), characterised by mature research infrastructure, progressive accreditation systems mandating health competencies, and evidence-based design methodologies embedded across curricula. Region II (Central/Eastern Europe) shows 15 schools (33.3%), equivalent integration rates despite fewer resources, suggesting strategic capacity building through specialised modules and medical faculty partnerships—a pattern consistent with emerging economies rapidly adopting evidence-based frameworks developed elsewhere (UIA Architecture Education Commission, 2025).

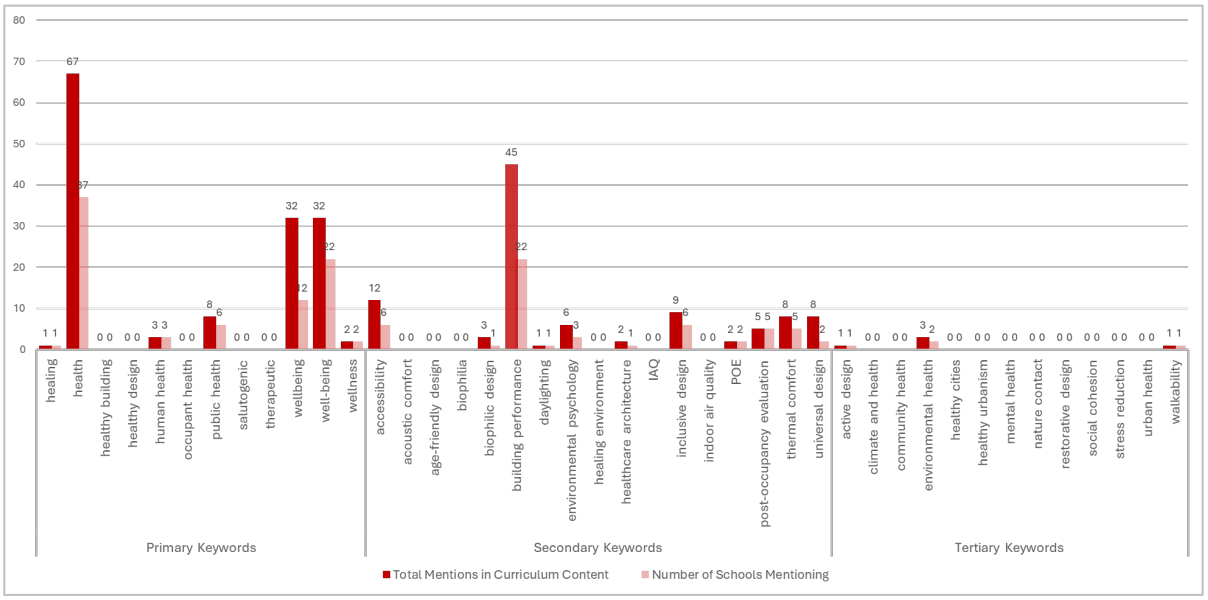


*Figure 2. Keyword frequency analysis across 345 architecture schools showing hierarchical distribution of health-related terminology with notable gaps in technical specifications.*

Region III (The Americas) includes 20 schools (22.2%), concentrated in North America, where joint architecture-public health degrees and dedicated research centres have proliferated, pioneering the shift from healthcare-specific expertise to foundational literacy for all practitioners. Region IV (Asia/Oceania) shows 20 schools (22.2%), driven by government-funded initiatives explicitly linking built environment education to population health outcomes, reflecting urgency around tropical heat stress, air pollution, and high-density urban health challenges intensified by climate change.

Region V (Africa) presents a stark contrast with only 5 schools (16.7%), severe underrepresentation relative to the 26% global average, reflecting systemic inequities in educational infrastructure, research funding, and faculty capacity. This disparity is particularly concerning given that African contexts face the most acute health challenges, such as informal settlement conditions, vector-borne diseases, and extreme heat vulnerability, yet generate the least educational capacity to address them. Alongside these structural gaps, several African schools, notably the University of Cape Town and Makerere University, have developed community-engaged pedagogical models addressing informal settlement health and climate-responsive design. These models represent genuine contextual innovation rather than adaptation of imported frameworks; however, it is important to avoid over-romanticising resource constraints as inherently generative. The institutional absence of research centres and formal cross-disciplinary collaborations in Region V reflects real limitations that constrain both knowledge production and pedagogical scalability. This pattern reveals profoundly uneven geographic distribution, with knowledge production concentrated in Global North institutions while implementation needs are most urgent in Global South contexts.

The 26% integration threshold indicates that health integration has moved beyond isolated experimentation toward a more broadly distributed practice, characterised by visible institutional examples, growing professional demand, and increasing disciplinary legitimacy. While this figure represents a meaningful shift, it should be understood as a significant minority position rather than a majority norm, and the characterisation of 26% as “critical mass” warrants interpretive caution pending comparative benchmarks from related curriculum reform studies. Educational integration appears poised for acceleration as accreditation bodies increasingly incorporate health competencies, graduates demonstrate market value through WELL AP credentials and evidence-based design expertise, and climate and pandemic crises foreground health's centrality to contemporary practice.

However, the 74% non-integration rate warrants critical attention. These 255 schools continue treating health implicitly through building codes rather than explicitly as a design imperative. This temporal lag

between research accumulation and educational integration suggests structural barriers: faculty capacity constraints, curriculum inertia, resource limitations, and competing priorities. The gap between accumulated disciplinary knowledge about health and what schools teach represents architectural education's central challenge in preparing practitioners for contemporary demands.

## 4.2 Five Integration Pathways

Analysis of 90 integrating schools reveals five distinct pathways with characteristic regional concentrations (Figure 3).

*Dedicated Programs and Specialisations* (69 schools, 76.7%) represent the dominant pathway globally, including Master of Science degrees in Healthcare Architecture, Graduate Certificates in Healthy Building Design, and specialised doctoral programs. Regional distribution: Region I leads with 25 programs (36.2% of all dedicated programs), Region III follows with 16 (23.2%), Region IV contributes 13 (18.8%), Region II offers 11 (15.9%), and Region V has 4 (5.8%). Examples include Politecnico di Milano's MSc Healthcare Architecture, Clemson's MA Architecture and Health, and NUS's High-Density Healthy Building Design track. The dominance (77% of integrating schools) suggests health requires sustained engagement rather than superficial coverage, though it risks marginalising health as niche expertise rather than core literacy (UIA Architecture Education Commission, 2025).

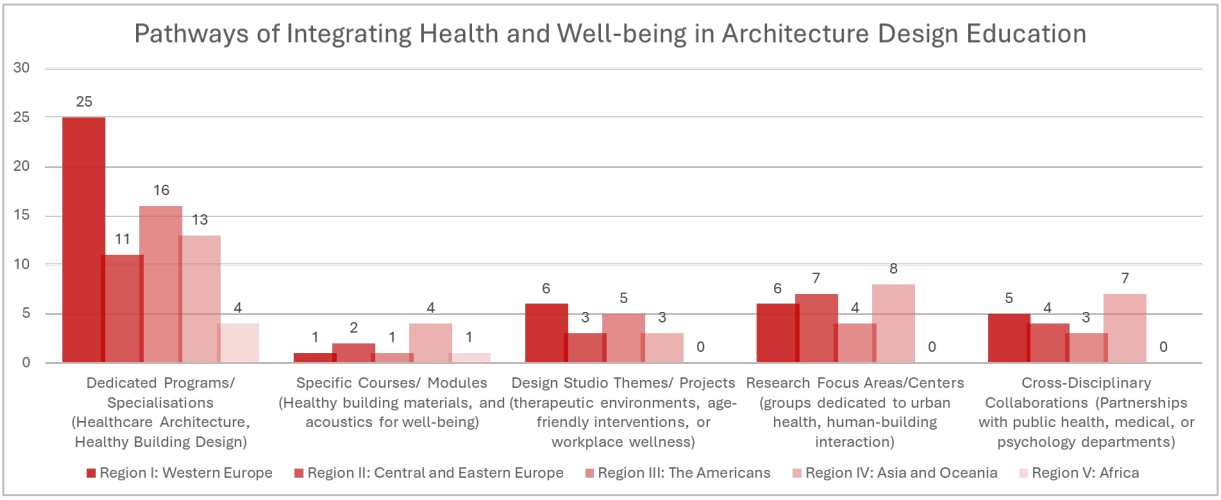


*Figure 3. Regional variations across five health integration pathways reveal dedicated programs as the most prevalent (69 schools) and standalone courses as the least common (8 schools), with stark disparities between Western Europe's comprehensive integration and Africa's minimal representation.*

*Research Focus Areas and Centres* (25 schools, 27.8%) maintain dedicated infrastructure advancing design-health knowledge. Region IV leads with 8 centres (32%); Region II contributes 7 (28%); Region I adds 6 (24%); Region III includes 4 (16%); and Region V has 0, a critical gap that constrains faculty research capacity and evidence generation. Examples include NUS's Centre for Sustainable Asian Cities, Tsinghua's Urban Environmental Quality Lab, and UCL's IEDE Health Comfort and Wellbeing group. Geographic concentration in Regions II and IV reflects strategic government investment addressing region-specific health challenges (Dannenberg et al., 2011; Gross et al., 2016; UIA Architecture Education Commission, 2025).

*Design Studio Themes and Projects* (20 schools, 22.2%) integrate health through project-based learning where briefs explicitly frame health challenges. Distribution: Region I shows 6 studios (30%), Region III contributes 5 (25%), Region V demonstrates 3 (15%), and Regions II and IV each show 3 (15%). Examples include Leeds' "Healthy Cities" studio and the University of Michigan's "Healthy Homes" studio. A relatively even distribution suggests that studio integration may be more accessible than dedicated programs while maintaining pedagogical impact (UIA Architecture Education Commission, 2025).

*Cross-Disciplinary Collaborations* (19 schools, 21.1%) establish formal partnerships with public health, medicine, or psychology faculties. Region IV leads with 7 collaborations (36.8%), Region I contributes 5 (26.3%), Region II adds 4 (21.1%), Region III contributes 3 (15.8%), and Region V contributes 0. Examples include Columbia's dual MA/MPH, Cardiff's architecture-medicine partnership, and Hong Kong University's architecture-gerontology lab. These cultivate competencies essential for contemporary practice yet remain accessible to only one-fifth of integrating schools (Corburn, 2009; Doorley et al., 2012; UIA Architecture Education Commission, 2025).

*Specific Courses and Modules* (8 schools, 8.9%) offer standalone health-focused courses. Region IV accounts for 4 schools (50%), Region II contributes 2 (25%), and Regions I and III each add 1 (12.5%). Region V offers none. This pathway's scarcity (2.3% of all schools globally) represents missed opportunities for accessible integration not requiring full program restructuring (UIA Architecture Education Commission, 2025).

## 4.3 Five Overarching Trends

Synthesis across 90 integrating schools reveals five trends reshaping the conceptualisation of health and well-being in architectural education globally (Figure 4). These trends collectively document a paradigm shift from health as specialised technical knowledge confined to healthcare facility design toward health as foundational literacy essential to all architectural practice, fundamentally reconceptualising the architect's role and professional competencies.

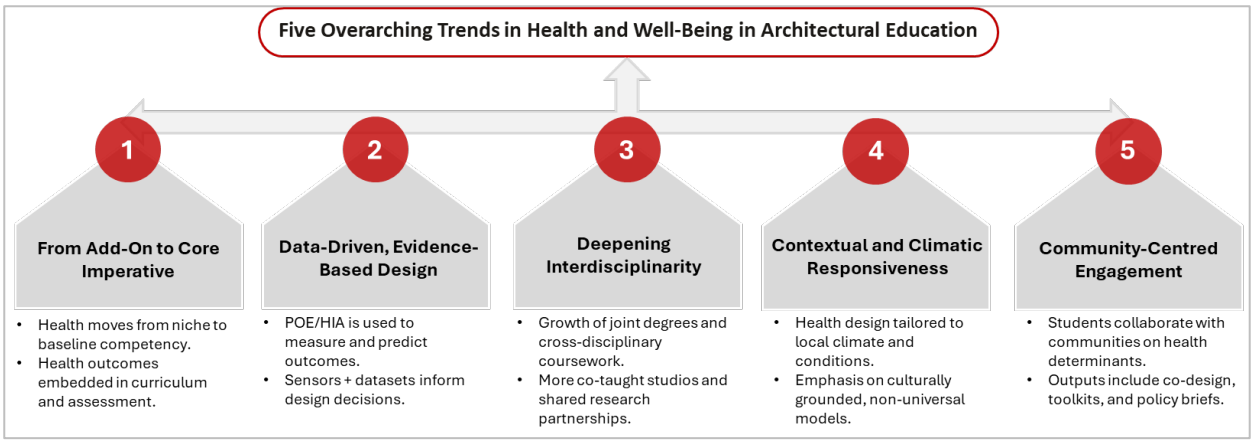


*Figure 4. Five transformative trends in health-integrated architectural education demonstrating paradigm shifts from niche specialisation to foundational competency, intuition-based to evidence-driven design, disciplinary insularity to cross-boundary collaboration, universal to contextually responsive models, and professional credentialing to community-engaged public health practice.*

### 4.3.1 Trend 1: From Add-On to Core Imperative

Historical treatment positioned health as specialised knowledge for healthcare facility designers, niche expertise acquired through post-professional specialisation. Current paradigm shift repositions health as a fundamental literacy required of all architects. Evidence includes proliferation of health-focused required courses within core curricula; integration of health outcome metrics into design studio assessment rubrics; appearance of health-related learning outcomes in program mission statements and accreditation documents; and development of signature pedagogies, post-occupancy evaluation and health impact assessment, embedding health evaluation into standard design processes. For instance, TU Delft now requires all architecture students to complete core modules on healthy building environments, while Cornell University integrates health-outcome assessment criteria into every design studio jury rubric, ensuring that all graduates develop foundational health literacy regardless of specialisation (UIA Architecture Education Commission, 2025).

### 4.3.2 Trend 2: Data-Driven, Evidence-Based Design

A defining characteristic is an epistemological shift from intuition-based to evidence-based decision-making. Manifestations include mandatory post-occupancy evaluation assignments requiring students to measure actual health outcomes (occupant satisfaction, thermal comfort, acoustic performance, indoor air quality); sensor-driven research deploying environmental monitors to assess lighting, temperature, CO2 concentrations; health impact assessment exercises predicting population health outcomes (physical activity rates, social interaction frequency, stress levels); and database integration accessing medical literature, epidemiological data, and building performance repositories. University of Sheffield exemplifies this approach by requiring final-year students to conduct POE studies measuring satisfaction and environmental performance in completed buildings, while MIT Senseable City Lab students analyse real-time pedestrian temperature data and noise pollution patterns using sensor networks. This empirical turn cultivates scientific literacy and accountability cultures, aligning architectural education with medical, public health, and engineering pedagogies (UIA Architecture Education Commission, 2025).

### 4.3.3 Trend 3: Deepening Interdisciplinarity

Health integration necessitates boundary-crossing collaboration with disciplines possessing complementary expertise, such as public health, medicine, environmental psychology, building science, and epidemiology. Manifestations include joint degree programs where architecture students complete public health coursework; co-taught studios where architecture and medical/public health students collaborate, bringing distinct epistemologies; research partnerships where architecture faculty co-investigate with health scientists; and community engagement where students work alongside public health practitioners conducting health needs assessments. Columbia University's dual MA Architecture/MPH exemplifies deep integration through joint degrees, co-taught courses, and shared research labs, while Cardiff University's architecture-medicine partnership enables students to conduct Health Impact Assessments alongside medical faculty to evaluate the predicted health outcomes of design interventions. These collaborations demonstrate movement beyond disciplinary insularity toward integrated approaches addressing complex health challenges (UIA Architecture Education Commission, 2025).

### 4.3.4 Trend 4: Contextual and Climatic Responsiveness

While universal principles exist (adequate daylighting benefits cognition globally), integration approaches demonstrate strong adaptation to regional contexts and climatic challenges. This contextual specificity cultivates situated knowledges and culturally grounded approaches, preventing the universalisation of Western/Global North models and ensuring that health interventions respond to local environmental conditions, cultural practices, and resource contexts. For example, NUS's High-Density Healthy Building Design program addresses tropical heat stress, humidity management, and high-rise ventilation strategies specific to Southeast Asian contexts, while University of Cape Town's curriculum centres on informal settlement health, passive cooling for resource-constrained environments, and culturally grounded communal space design reflecting African urban realities (UIA Architecture Education Commission, 2025).

### 4.3.5 Trend 5: Community-Centred Engagement

Many health-integrated programs position students as public health interventionists working directly with communities, addressing spatial determinants of health. Manifestations include living laboratories where students design, prototype, and test interventions with participatory evaluation; policy briefs translating research findings into actionable recommendations for municipal authorities; and co-design processes where community members function as partners shaping problem definition, solution development, and outcome assessment. University of Cape Town's Informal Settlements Lab demonstrates this approach through students co-designing incremental housing upgrades with

Khayelitsha residents, producing Community Health and Habitat toolkits shared with municipal authorities, while Makerere University's Slum Resilience studio has students submit policy briefs to Kampala City Council on flood-resilient sanitation based on baseline health data collected with community partners. This engagement reframes architectural education from professional credentialing to social mission, cultivating ethical commitments to health equity (UIA Architecture Education Commission, 2025).

# 5 Discussion

Health integration in architectural education has reached a critical threshold, moving from isolated innovation to emerging norm with transformative potential extending far beyond its specific domain. Rather than merely adding health content to existing curricula, leading institutions demonstrate how health functions as an integrative framework connecting sustainability, equity, evidence-based practice, interdisciplinarity, and community engagement. This discussion moves beyond the "what" to interrogate the "why" and "what next": why do these regional patterns exist, what structural and historical forces explain them, and where does the evidence remain uncertain or contested. It synthesises findings to examine paradigm shifts, pedagogical innovations, strategic opportunities, cultural dimensions, and professional identity evolution, positioning health integration as a model for addressing interconnected challenges in 21st-century architectural education.

## 5.1 Paradigm Transformation: From Incremental Adjustment to Systemic Reimagining

Findings reveal architectural education midway through fundamental transformation, yet the 26% integration threshold signals meaningful but incomplete progress. Compared with curriculum reform trajectories documented in sustainability and digital technology integration, where adoption in the 20–30% range has historically preceded more rapid diffusion, the current figure may indicate conditions favourable to acceleration, though this parallel should not be overstated (Dritsa, 2018). What the data do support is that sufficient institutional diversity now exists to enable peer-learning exchanges: institutions can draw on documented models, accreditation bodies have concrete examples on which to base emerging competency frameworks, and professional organisations can identify exemplars to amplify through continuing education and practice guidelines.

Current integration manifests through competing models, revealing distinct possibilities. Western Europe and the Americas demonstrate integration models that weave health throughout existing curricula, which are embedded in core studios, accessible electives, and distributed research agendas, reflecting institutional maturity and faculty expertise breadth. This approach positions health as a foundational lens rather than as additive content, enabling students to encounter health principles repeatedly across contexts and deepen their understanding through progressive complexity. The integration model's strength lies in normalising health as an intrinsic design consideration, yet it risks superficial coverage that lacks depth. Central/Eastern Europe and Africa demonstrate specialisation models, dedicated modules, standalone labs, and concentrated faculty expertise, reflecting strategic capacity building in resource-constrained contexts. This approach develops deep expertise before diffusion, ensuring rigorous grounding, yet risks marginalising health as niche specialisation. Asia/Oceania's hybrid patterns suggest a third possibility: leading universities operating integration models while emerging programs adopt specialisation strategies, creating tiered capacity building that transitions from concentrated expertise to distributed literacy as resources expand.

These competing models present strategic choice points for institutions at different maturity levels, resource contexts, and pedagogical philosophies. Rather than a universal prescription, the field could benefit from model pluralism, where institutions select approaches aligned with contexts while maintaining quality through shared learning outcomes. This flexibility enables contextually appropriate pathways while ensuring all graduates achieve baseline health competencies. The paradigm

transformation extends beyond health itself, positioning health as an integrative framework connecting contemporary imperatives. Health operationalises sustainability through healthy materials and energy-efficient thermal comfort systems (Altomonte et al., 2020; Najafi & Rahimian, 2024). Health manifests equity through universal design and informal settlement interventions. Health bridges discourse and practice through post-occupancy evaluation, measuring real outcomes (Preiser & Vischer, 2005). This integrative capacity suggests health integration could model comprehensive curricular transformation addressing interconnected challenges rather than siloed responses.

## 5.2 Pedagogical Innovations: Emergent Practices Redefining Architectural Learning

Health-integrated programs generate pedagogical innovations with transformative potential extending beyond the health domain. *Evidence-based design integration* positions empirical methods such as post-occupancy evaluation, sensor-driven monitoring, and health outcome measurement as core competencies rather than specialised research skills. Students translate occupant surveys into design modifications, correlate indoor air quality data with cognitive performance (Satish et al., 2012; Wargocki et al., 2000), and predict population health impacts. This empirical turn cultivates scientific literacy, aligning architectural education with medical, public health, and engineering pedagogies. Systematic reviews confirm that evidence-based approaches to indoor environmental quality demonstrate measurable impacts on occupant wellbeing and performance (Nik Zafri & Nawawi, 2021; Rashid & Zimring, 2008). The innovation extends beyond skill acquisition: evidence-based approaches fundamentally alter design epistemology from aesthetic judgment and precedent-based reasoning toward hypothesis-driven inquiry and outcome validation. This shift opens possibilities for architecture to engage contemporary challenges requiring measurable impact demonstration, climate adaptation effectiveness, social equity outcomes, economic development contributions, and positioning architects as accountable change agents rather than form-makers.

*Interdisciplinary collaboration frameworks* embedding students in multidisciplinary teams through joint degrees, co-taught studios, and research partnerships cultivate competencies translating across epistemologies. Architecture students learn to communicate with health professionals, integrate diverse knowledge systems, and navigate disciplinary tensions between design thinking and scientific method. These collaborations prepare graduates for contemporary practice addressing "wicked problems" that require boundary-crossing expertise, while also generating broader possibilities. The interdisciplinary model could extend beyond health partnerships to address intersecting challenges, architecture-climate science collaborations modelling adaptation interventions, architecture-social science partnerships measuring community resilience, and architecture-economics collaborations demonstrating social return on investment. Health partnerships establish precedent for systematic interdisciplinary capacity across architectural education.

*Community engagement as core pedagogy* repositions students from professional credentialing seekers to public health interventionists. Paradoxically, resource-constrained contexts generate the most innovative pedagogical models. In Africa and parts of Asia, informal settlements serve as living laboratories where students collect baseline health data (diarrheal disease prevalence, vector-borne disease incidence), co-design spatial interventions, prototype solutions (sanitation hubs, passive ventilation systems), and evaluate health outcomes through participatory methods. UCT's Khayelitsha partnerships, Makerere's Kampala studio, and UTS's Western Sydney work demonstrate this approach (Sanoff, 2000). This pedagogy generates situated knowledge about design-health relationships in contexts underrepresented in Global North research while cultivating ethical commitments to health equity. Evidence demonstrates that biophilic design elements integrated through community-engaged projects yield measurable improvements in occupant wellbeing and productivity (Ryan et al., 2014; Sepucha et al., 2021). The innovation suggests meaningful health integration may require fundamentally rethinking architectural education rather than adding health content to existing structures. Community-engaged learning transforms education from simulated problems and

hypothetical clients to real-world complexity, accountability to actual communities, and ethical responsibility for intervention outcomes, preparing graduates for socially engaged practice increasingly demanded by communities confronting climate change, housing crises, and health inequities (Watson, 2009). However, in practice, the community engagement is often under-represented and falls between the architectural brief development, statutory public consultations and promotional dissemination.

*Post-occupancy evaluation as signature pedagogy* transforms POE from a specialised research method to a standard learning tool. Requirements that students measure actual health outcomes in completed buildings, such as thermal comfort, acoustic performance, and occupant satisfaction, create feedback loops linking design decisions to consequences, fostering accountability. This pedagogical innovation addresses architecture's historic weakness: designers rarely learn from completed work, perpetuating errors and preventing systematic improvement. POE integration establishes continuous learning mechanisms in which evidence from built projects informs future design, advancing cumulative knowledge. This approach could revolutionise architectural education by establishing practice-based learning cycles, professional accountability cultures, and evidence accumulation infrastructure rivalling medicine's systematic outcome tracking. But in reality, the post-occupancy evaluation is not integrated into the architectural contract and remains underrepresented in practice.

*Multi-scalar thinking* spans interiors, buildings, neighbourhoods, cities, and regions, positioning health as a connecting thread across scales. Building-scale addresses indoor environmental quality; neighbourhood-scale emphasises walkability and green space access; urban/regional-scale addresses population health systems, including heat island mitigation and disaster resilience. This scalar fluidity prepares graduates to recognise that health interventions require coordinated action across scales; individual buildings cannot achieve health outcomes if situated in polluted, car-dependent, heat-vulnerable neighbourhoods. Multi-scalar thinking cultivates a systems perspective applicable beyond health to integrated challenges like climate adaptation, requiring coordinated interventions from material selection to regional planning.

## 5.3 Persistent Gaps and Strategic Opportunities for Transformation

Three critical gaps reveal strategic intervention opportunities. *Geographic inequity*, as shown by Africa's 16.7% integration versus 26% global average, zero research centres, and zero collaborations, represents severe underrepresentation given acute health challenges (Maturana et al., 2021) , including informal settlement conditions, vector-borne diseases, and extreme heat vulnerability. Yet this gap presents a transformative opportunity rather than a mere deficit. Africa's pioneering community-engaged pedagogies demonstrate that resource constraints can catalyse innovation, generating pedagogical models with profound Global South relevance. Strategic interventions could position Africa as innovation hub rather than knowledge recipient: establishing South-South knowledge exchange networks connecting African, Asian, and Latin American schools developing contextually appropriate approaches; creating open-access curriculum resources co-developed by Global South institutions; launching twinning programs pairing schools across resource contexts for reciprocal learning rather than unidirectional capacity building; providing seed funding for research infrastructure enabling African schools to generate evidence on region-specific challenges, shifting from knowledge importation to knowledge production. These interventions could transform global architectural education by decentring Global North dominance and recognising diverse contexts as sources of pedagogical innovation.

*Partnership configurations* reveal opportunities for targeted development. North America and Western Europe established mature co-supervised studio models in which architecture and public health students collaborate, bringing distinct epistemologies such as architects contributing spatial, material, and experiential design thinking, while public health students contribute population-level health data, epidemiological analysis, and community health assessment methods. Columbia's dual MA/MPH and Cardiff's architecture-medicine partnership exemplify deep integration through joint degrees, co-taught courses, and shared research labs. Healthcare settings provide particularly rich contexts for

architectural-health partnerships, with research demonstrating that physical environmental design significantly influences patient satisfaction and recovery outcomes (Ozgen & Kundakci, 2022; Raeissi et al., 2019). Asia/Oceania demonstrates problem-driven partnerships forming around specific health threats, including tropical heat stress, air pollution, and ageing populations, with Hong Kong's architecture-gerontology lab and NUS's public health partnerships leveraging government funding (Stone et al., 2014). Central/Eastern Europe shows emerging partnerships catalysed by EU Horizon programs. Africa's absence of formal partnerships represents a critical gap requiring targeted capacity-building to establish faculty networks, institutional partnerships, and collaborative research structures, yet this gap presents an opportunity to develop partnership models addressing African contexts directly rather than importing Global North structures requiring adaptation.

*Pathway imbalance*, as seen in standalone courses, constitutes only 8.9% of integrating schools (2.3% globally), representing missed opportunities for accessible, scalable integration not requiring full program restructuring. This "all or nothing" pattern prevents incremental capacity building in resource-constrained contexts. Yet this gap reveals transformative potential: developing modular course sequences that institutions can adopt individually or cumulatively, creating pathways from single courses to comprehensive programs; establishing shared course resources enabling schools without health expertise to offer rigorous instruction through open educational materials, recorded lectures, and distance learning collaborations; designing assessment frameworks enabling students to demonstrate health competencies regardless of institutional pathway, creating credential portability; developing faculty development programs building distributed expertise rather than concentrating knowledge in few specialists. These interventions could democratise access to health-integrated education, enabling schools across diverse resource contexts to participate in the transformation.

## 5.4 Cultural Dimensions: Regional Well-Being Framings as Pedagogical Opportunity

Regions conceptualise well-being through distinct lenses, revealing pedagogical opportunities for cultivating cultural competency. Subjective well-being frameworks acknowledge that interior and architectural design must respond to culturally specific dimensions of physical, emotional, and psychological health (Petermans & Pohlmeyer, 2014). Western Europe emphasises mental health through views of green space, reducing stress, acoustic comfort supporting concentration, daylighting regulating circadian rhythms, and reflecting affluent societies that address post-materialist concerns after basic needs satisfaction (Kaplan, 1995; Ulrich et al., 1991). The Americas foreground social cohesion where spatial design fosters support networks, mitigating isolation, enabling civic participation, reflecting societies confronting social fragmentation and individualism (Talen, 1999). Africa prioritises psychosocial support through communal spaces, enabling mutual aid, trauma-informed design in post-conflict contexts, culturally grounded healing practices, and reflecting contexts addressing collective trauma and resource scarcity through community solidarity.

These framings prevent universalising single definitions, positioning well-being as culturally constructed, requiring situated responses. This diversity challenges the notion of universal "healthy building" standards, suggesting accreditation frameworks and building certifications must accommodate culturally plural definitions of well-being. Contemporary building certifications increasingly recognise the need to integrate diverse health and well-being considerations alongside environmental sustainability metrics, though cultural adaptation remains incomplete (Von Kaenel & Nylund, 2023). Yet this plurality presents pedagogical opportunity: educational programs exposing students to multiple regional framings produce culturally competent practitioners capable of context-appropriate health-centred design. Rather than viewing regional differences as complicating standardisation, architecture education can embrace pluralism as preparing graduates for global practice requiring cultural adaptability. Students learning Western European mental health frameworks, American social cohesion approaches, and African psychosocial support models develop the capacity

to work across cultural contexts, collaborate with diverse communities, and design health interventions respecting cultural specificity while applying universal principles.

This cultural dimension suggests architecture education can position health integration as a vehicle for developing graduates' capacity to navigate cultural difference, an essential competency for 21st-century practice in an increasingly globalised yet culturally diverse world. Health becomes a pedagogical opportunity for cultivating cultural humility, recognising the limits of one's cultural framework, and developing collaborative approaches valuing diverse knowledge systems.

## 5.5 Implications for Evolving Professional Identity: Architects as Stewards of Human Flourishing

Health integration fundamentally reconceptualises architects' professional identity and competencies, revealing transformative possibilities for the profession's future role. The traditional identity of the spatial problem-solver, translating client programs into built form through aesthetic, technical, and functional expertise, expands toward architects as public health agents collaborating with epidemiologists, physicians, and community organisers to create environments actively promoting well-being. This evolution demands new competencies yet creates expanded professional opportunities.

*Policy literacy* enables architects to engage municipal health departments, housing authorities, and planning agencies as partners, shaping regulations and standards, positioning architects as policy influencers rather than code compliers. This competency opens possibilities for architects to shape the regulatory frameworks governing the built environment rather than merely responding to externally imposed requirements, elevating professional influence in societal decision-making. Advocacy skills positioning architects as expert witnesses on design-health relationships in policy debates expand professional roles beyond service provision to public intellectuals shaping societal discourse on urgent challenges. Systems thinking, recognising built environment interventions within complex social-ecological systems, cultivates the capacity to address root causes rather than symptoms, positioning architects as change agents addressing systemic challenges like health inequity, climate vulnerability, and social isolation (Dannenberg et al., 2011).

*Community engagement methodologies* facilitating participatory processes centring end-user knowledge transform architect-client relationships from expert-driven to collaborative, democratizing design decisions and ensuring interventions serve community needs rather than imposing professional visions. This shift responds to increasing demands for community agency in shaping built environments, positioning architects as facilitators rather than authorities. Empirical research capabilities, conducting post-occupancy evaluations and health impact assessments, establish architects as knowledge producers generating evidence informing practice, elevating professional credibility through demonstrated outcomes rather than aesthetic argumentation alone. Emerging technologies, including AI-generated health indicators, offer new possibilities for architects to measure and predict design-health relationships with unprecedented precision (Bakir & Attia, 2025), while post-occupancy studies of accessible housing demonstrate measurable health-related quality of life improvements following evidence-based modifications (Carnemolla & Bridge, 2016). Interdisciplinary communication, translating across professional languages and epistemologies (Doorley et al., 2012), positions architects as boundary-spanners connecting disciplines, playing an essential role in addressing complex challenges requiring integrated expertise.

This transformation aligns with calls for multi-intelligence frameworks in professional development, recognising that effective health-centred practice requires not only spatial intelligence but interpersonal intelligence (collaboration), intrapersonal intelligence (ethical reflection), naturalist intelligence (biophilic design), and logical-mathematical intelligence (evidence-based analysis). Architecture schools integrating health cultivate these multifaceted competencies, preparing graduates to function as stewards of human and planetary flourishing (Stevens et al., 2019),

practitioners whose work measurably improves health outcomes, reduces health inequities, enhances quality of life across diverse populations and contexts, and contributes to building resilient communities capable of thriving amid 21st-century challenges, including climate change, urbanisation, and demographic shifts. This expanded professional identity positions architecture as an indispensable profession addressing society's most pressing challenges, elevating disciplinary relevance and social value far beyond its traditional form-making role.

# 6 Recommendations

Achieving universal health integration requires strategic interventions across educational institutions, professional bodies, and research communities. The following recommendations offer actionable pathways for the 74% of schools currently without explicit integration, emphasising accessible entry points, South-South knowledge exchange, and context-appropriate strategies that enable institutions across diverse resource environments to advance health literacy as a foundational architectural competency.

## 6.1 For Educational Institutions

- *Curriculum Integration Strategies:* Schools could pursue vertical integration across all studio years, ensuring progressive skill development. First-year studios introduce environmental quality concepts (daylighting, ventilation); second year incorporates biophilic design and universal accessibility and elements of physical ergonomics (related to the standard Metric handbook, Neufert and similar spatial standards dealing with body-object-space parameters); third year applies post-occupancy evaluation; fourth/fifth-year conducts health impact assessments. This scaffolded approach normalises health as a foundational design criterion without requiring wholesale curriculum restructuring.
- *Accessible Entry Points:* Institutions lacking resources for dedicated programs can begin with single required courses on healthy environments addressing indoor environmental quality fundamentals, biophilic design principles, universal design, and evidence-based design methodologies. Post-occupancy evaluation assignments requiring students to measure occupant health outcomes create accountability feedback loops without major infrastructure investment. Living laboratory partnerships with community organisations enable students to design, prototype, and evaluate interventions addressing real health challenges.
- *Faculty Development:* Cross-training programs could provide architecture faculty foundational knowledge in public health (epidemiology, health determinants), environmental psychology (spatial cognition, restorative environments), and building science (indoor air quality, thermal modelling). Institutions should support interdisciplinary research through joint appointments, seed funding for pilot projects, and promotion criteria recognising interdisciplinary scholarship. Professional development in evidence-based design trains faculty in post-occupancy evaluation methodologies, sensor deployment, and health outcome measurement.
- *Strategic Infrastructure Investment:* Environmental monitoring equipment, temperature/humidity sensors, light meters, sound level meters, and indoor air quality monitors enable students to conduct empirical building performance studies. Partnerships with health sciences libraries grant architecture students access to medical/public health literature and research databases. For resource-constrained institutions, shared equipment cooperatives and open-access databases provide cost-effective alternatives to individual investments.

## 6.2 For Professional Bodies and UIA

- *Accreditation Standards Evolution:* Professional accreditation bodies could incorporate health and well-being learning outcomes as required student performance criteria, including understanding built environment-health relationships, applying evidence-based design strategies, conducting post-occupancy evaluations, designing universally accessible environments, and collaborating with public health professionals. Demonstration requirements should mandate interdisciplinary collaboration experiences and post-occupancy evaluation training, ensuring graduates possess baseline health competencies regardless of specialisation pathway.
- *Knowledge Sharing Infrastructure:* UIA could establish a Health and Architecture Education Network, facilitating global knowledge exchange through annual convenings, webinar series, and working groups developing shared resources. An open-access repository archiving syllabi, case studies, teaching materials, and assessment instruments enables schools worldwide to adopt proven approaches without duplicating development efforts. This infrastructure should particularly support resource-constrained institutions accessing expertise developed by mature programs.
- *Targeted Capacity Building:* Dedicated support for underrepresented regions, particularly Africa (16.7% integration) and Central/Eastern Europe (11.1% keyword presence), could include curriculum development grants, faculty training workshops, equipment grants, and technical assistance. Twinning programs pairing mature and emerging schools enable faculty exchanges, joint research, curriculum sharing, and student mobility. Seed funding for research centres in Global South contexts establishes dedicated health-design infrastructure enabling evidence generation on region-specific challenges, shifting from knowledge importation to knowledge production.
- *South-South Knowledge Exchange:* Rather than unidirectional Global North-to-South capacity building, establish networks connecting African, Asian, and Latin American schools, developing contextually appropriate approaches. These networks recognise resource-constrained contexts as innovation sources generating pedagogical models with broader applicability, decentering Global North dominance while building reciprocal learning relationships.

## 6.3 For Research Communities

- *Longitudinal Impact Studies:* The research communities could track integration evolution over 5-10 years, documenting how schools deepen health engagement, how accreditation changes drive adoption, and how graduate career trajectories differ between health-focused and traditional programs. Compare the health performance of buildings designed by health-trained versus traditionally trained graduates through systematic post-occupancy studies, establishing evidence base for integration's professional value.
- *Pedagogical Pathway Evaluation:* The communities can conduct comparative studies assessing the effectiveness and efficiency of dedicated programs versus integrated curricula versus standalone courses, informing institutions selecting approaches aligned with contexts and resources. Cost-benefit analyses quantify return on investment, documenting resource requirements and measurable outcomes to support institutional decision-making.
- *Context-Specific Evidence Generation:* Prioritising research in underrepresented contexts, informal settlement health, tropical climate design, and culturally grounded well-being concepts will address the geographic concentration of health-design evidence in Global North contexts. Supporting research infrastructure in Global South institutions could enable locally relevant evidence generation rather than importing frameworks requiring adaptation.

- *Implementation Science:* Examining failed or discontinued initiatives helps understand why promising programs end and identify sustainability factors. Documenting barriers to integration enables recognising faculty capacity constraints, curriculum inertia, resource limitations, competing priorities, and effective strategies overcoming obstacles, creating evidence-based implementation guides for institutions at various maturity levels.

# 7 Conclusion

This first systematic global analysis of health and well-being integration in architectural education reveals a discipline in transition. Of 345 schools across 159 countries, 90 (26.1%) explicitly integrate health and well-being, a critical threshold indicating movement from isolated innovation to emerging norm. Integration occurs through five pathways: dedicated programs (69 schools, most prevalent), research centres (25 schools), design studios (20 schools), cross-disciplinary collaborations (19 schools), and courses/modules (8 schools, least common). Regional analysis reveals striking disparities: Western Europe and Central/Eastern Europe lead with 33.3% integration rates, followed by the Americas (22.2%) and Asia/Oceania (22.2%), while Africa significantly lags at 16.7% with critical infrastructure gaps such as zero research centres and zero collaborations, exposing profound global inequities.

Five overarching trends emerge: health transitioning from add-on to core imperative, data-driven evidence-based design methodologies, deepening interdisciplinarity through public health partnerships, contextual and climatic responsiveness, and community-centred engagement positioning students as public health interventionists. The findings document a paradigm shift from health as specialised expertise (healthcare facility design) to foundational literacy (all architects as public health agents). Leading institutions embed health principles throughout curricula via post-occupancy evaluation requirements, interdisciplinary studios with medical faculties, and living laboratories in community settings. Yet 74% of schools show no explicit integration, indicating incomplete transformation. Persistent gaps include standalone courses representing only 2.3% of schools globally, research infrastructure absent in Africa, and limited South-South knowledge exchange.

Health integration holds significance beyond its specific domain, functioning as connective tissue linking contemporary architectural education's most pressing imperatives. Health operationalises sustainability through healthy materials and energy-efficient thermal comfort systems, manifests equity through universal design and informal settlement interventions, and bridges discourse and practice through post-occupancy evaluation measuring real outcomes (Preiser & Vischer, 2005). This integrative capacity positions health as a model for addressing other cross-cutting themes in the ten-paper UIA survey series: SDG integration, decolonisation, AI transformation, and transdisciplinary collaboration. Pedagogical innovations documented here, including evidence-based design, interdisciplinary partnerships, community engagement, and multi-scalar thinking, apply equally to integrating climate action, indigenous knowledge systems, or computational design (Doorley et al., 2012; Watson, 2009).

Advancing from 26% to universal integration requires coordinated action. Accreditation bodies must incorporate health learning outcomes as required criteria, leveraging the current momentum before resistance calcifies. Educational institutions should pursue incremental integration strategies: introducing standalone health courses as accessible entry points, embedding health criteria into studio rubrics, partnering with local public health agencies for collaborative projects, and conducting post-occupancy evaluations as standard pedagogical practice. Health Impact Assessment (HIA) merits particular attention as a concrete and scalable pedagogical instrument. HIA protocols enable students to systematically evaluate the predicted health consequences of design decisions on a given population before construction, integrating epidemiological data, spatial analysis, and community consultation within a structured methodological framework. Cardiff University’s architecture-medicine partnership

has demonstrated that incorporating HIA exercises into studio projects equips students to operate as public health agents in a rigorous, replicable way – bridging the perennial gap between education and practice identified throughout this study. Extending HIA-based learning beyond individual flagship programmes toward wider adoption could operationalise the "architects as public health agents" paradigm in a manner that is both methodologically sound and accessible to schools without dedicated research infrastructure. Research communities must expand the evidence base on design-health relationships, particularly in underrepresented contexts, prioritising informal settlement health, tropical climate design, and culturally grounded well-being concepts that challenge Western-centric frameworks. Strategic investments should position Africa and the Global South as innovation hubs, generating contextually appropriate pedagogical models rather than importing Northern approaches requiring adaptation.

This study launches the first comprehensive evidence-based analysis of how architectural education worldwide is transforming to equip future practitioners to design environments nurturing human and planetary flourishing. The 26% integration threshold represents a meaningful concentration of institutional practice, sufficient to demonstrate viability to sceptics, enable peer-learning networks, and provide accreditation bodies with concrete examples on which to base competency frameworks. It does not, however, constitute a majority position, and characterising it as a "tipping point" should be understood as an aspirational framing rather than a theoretically derived claim. The question is no longer whether health belongs in architectural education but how rapidly and equitably the remaining 74% of schools can access integration pathways. The path forward requires recognising that health integration is not merely curricular addition but pedagogical reimagining, positioning architects as stewards of human flourishing whose work measurably improves health outcomes, reduces health inequities, and contributes to building resilient communities capable of thriving amid climate change, urbanisation, and demographic shifts. As the first in a six-paper series examining cross-cutting transformations in architectural education, this analysis establishes both the urgency and the possibility of fundamental disciplinary evolution.

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**Data Availability Statement**
The data presented in this study are available on reasonable request from the corresponding author.

**Conflicts of Interest**
The authors declare no conflicts of interest.

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