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Rethinking Educational Building Codes in the Gulf: An Ethical Reading through the AIA Framework

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Abstract

This paper examines educational building codes across the Gulf region through an ethics-centered lens, asking how well current regulatory frameworks actually translate into decent indoor environmental quality and meaningful day-to-day user experience. The American Institute of Architects (AIA) ethical orientation—anchored in the triad of health, safety, and welfare—serves as the analytical backbone for exploring the link between regulatory compliance and quality of life inside educational facilities. Methodologically, the study takes a qualitative route: it pairs a critical reading of recent Gulf-focused literature with a field survey targeting occupants of educational buildings in Bahrain. What emerges is a conspicuous mismatch between official compliance with formal codes and users' actual reports on thermal comfort, indoor air quality, acoustic conditions, and access to natural daylight. The paper argues that revisiting educational building regulations through an ethical, performance-driven approach—one that genuinely centers user experience—could pave the way for healthier, more comfortable, and more supportive learning environments across the Gulf.

Keywords: Educational buildings; Building codes; Indoor Environmental Quality; AIA ethical framework; Gulf region.

1 Introduction

- Against this backdrop, building legislation and planning have evolved well beyond their earlier role as bureaucratic tools for granting construction permits. They now function as mechanisms, seeking to safeguard health, safety, and welfare by governing how buildings are designed, constructed, and operated. This very objective runs parallel to prominent international professional frameworks, including those of the American Institute of Architects (AIA) and the Royal Institute of British Architects (RIBA), both of which root architectural practice in ethical codes and professional competencies that place the architect in a position of direct accountability for the quality of the built environment and its health implications for occupants and the community at large (AIA, 2014; RIBA, 2020).

That said, the actual relationship between what building codes prescribe on paper and the health or quality-of-life outcomes they produce on the ground—especially in the Kingdom of Bahrain—has yet to receive the depth of scholarly attention it deserves. In practice, a culture of minimum compliance prevails, ticking off prescriptive checklist items rather than verifying whether real occupant outcomes are being achieved (AIA, 2014; RIBA, 2020). There is a mounting need to shift toward performance-oriented frameworks that explicitly weave measurable field indicators—indoor air quality, thermal comfort, daylight levels, noise exposure, fire safety, and accessibility—into the regulatory language and evaluation criteria.

The Gulf's distinctive climatic realities and local usage habits also raise an important methodological concern. Behavioral and adaptive responses here may differ considerably from the assumptions baked into widely used global thermal comfort models (Alwetaishi et al., 2024), and this calls for recalibrating performance indicators to suit local conditions and tying them back to code requirements, inspection routines, and operational standards.

The paper zeroes in on buildings built for education—specifically, educational environments across the Arabian Gulf, with a particular focus on Bahrain. The ~~logic~~ behind this choice is that educational buildings offer a particularly telling case study: they sit at the crossroads between building codes and regulatory requirements on one side, and the lived quality of life and psychological well-being of the people who use them on the other.

Several factors converge to make educational settings an especially fitting focus for this study. First and foremost, these environments carry enormous weight in shaping the behavior of individuals who spend the better part of each day in them. Yet despite this significance, and despite considerable progress in regulatory systems across the Gulf, there remains a notable absence of an integrative, field-ready model for educational buildings—one that bridges local regulations with

international benchmarks, embeds post-occupancy evaluation tools, and turns lofty architectural and ethical principles about user wellbeing into something concrete and measurable.

Analytically and statistically, the paper sets out to unpack how the application of green building legislation affects the quality of educational environments along four key dimensions: thermal comfort, air quality, daylight provision, and sound insulation—all of which carry direct implications for occupant quality of life.

The empirical grounding for this paper comes from two sources. The first is a set of recent experimental studies conducted in the Gulf (within the last three years) on indoor environmental quality in educational buildings. The second is a targeted survey of users of educational environments in the Kingdom of Bahrain, conducted in 2025.

On the theoretical side, the study draws on Chapter Thirteen of the AIA Handbook (AIA, 2014), which examines the nexus between regulatory codes and applied professional practice in the built environment, treating regulations as instruments that should ultimately safeguard users' quality of life. ~~The paper also connects the local regulatory landscape in Bahrain~~ —shaped principally by the Green Building Guide of the Kingdom of Bahrain (Version 2.3), published by the Sustainable Energy Authority in 2021 and adopted as both a guideline and a regulatory reference for embedding sustainability principles in building design and operation (Sustainable Energy Authority, 2021)—to a broader model that could inform the development of educational building codes, with the ultimate goal of turning these facilities into liveable, humane environments whose performance can be measured and assessed.

1.1 Research Problem

The problem this paper addresses revolves around three interrelated issues:

a. A wide and well-documented gap between the formal existence of regulatory frameworks and codes on one hand, and their practical implementation within educational settings on the other—a gap that narrows the prospects for producing genuinely healthy and balanced educational facilities.
b. Weak institutional coordination between the licensing and legislative bodies and the educational and professional organizations. This disconnect hampers the ability to track whether quality-of-life and well-being indicators among building users are rising or falling, using either quantitative or qualitative measures.

1.2 Research Questions

a. In terms of actual performance: to what degree do Bahrain's building and planning regulations contain provisions that help raise psychological health levels and improve quality-of-life indicators in educational settings—covering lighting, ventilation, indoor temperature, and general safety? And how might a comparison between these local regulations and the professional practice obligations outlined in Chapter Thirteen of the AIA Handbook—with its ethical commitments to fostering healthy educational environments—help to close the key gaps between what the codes say and what happens on the ground?
b. What kinds of regulatory and professional mechanisms could be introduced to steer Gulf educational buildings toward a genuinely performance-based design and operating system?
c. How can the findings of this study be channeled into developing guidelines that regulatory oversight mechanisms can use to build performance indicators, one that advances building codes and strengthens their enforcement in educational facilities to safeguard indoor environmental quality and occupant wellbeing? In the Gulf region or in Bahrain

1.3 The research objective:

The research also seeks to build a comparative, integrated framework that maps the relationship between Bahrain's regulatory legislation for educational facilities and the resulting indoor educational environments along four key dimensions: thermal comfort, air quality, daylight provision, and sound insulation and quality of life for building users. Beyond that, it aims to sketch a practical pathway toward a performance-based regulatory system—one that measures environmental comfort and psychological health indicators in educational spaces in real terms, folding field study data and user surveys into the ongoing process of developing and refining codes and regulations, and thereby feeding into a healthier and more sustainable educational ecosystem.

2 Literature Review

The following research papers were conducted to discuss Green School Buildings

2.1 Green School Buildings and Environmental Holistic Elements – Bahrain Case Study (2024)

Published in the Journal of Sustainable Cities and Built Environment in 2024, this study by Da'abis (2024) examined the design of green schools in Bahrain in a hot, humid climate that poses a battery of environmental challenges—challenges that take a toll on both the quality of life in educational settings and the performance of the buildings themselves.

The author contended that Bahraini schools, despite significant infrastructure improvements, still lag somewhat in accommodating the Gulf's climatic particularities (Da'abis, 2024). The upshot is a reliance on generic building designs that were never tailored to hot-humid conditions, which means classrooms continue to overheat and energy bills keep climbing.

The study, however, acknowledged progress in developing legislation—most notably the issuance of Bahrain's Green Building Guide in 2021, which marked a genuine turning point for construction practices in green building concepts. Still, the researchers noted that the practical application of these concepts remains constrained by a lack of institutional oversight and follow-through.

At its core, the study advanced the hypothesis that weaving holistic environmental design principles into educational environments can boost environmental performance indicators, cut ~~energy consumption,~~ and—perhaps most

importantly—enhance both the psychological and physical well-being of building users. The researchers stressed that, in the Bahraini context, green building design is not just about thermal efficiency; it extends to shaping a pedagogical environment that actively supports learning and a positive relationship with the physical space.

2.1.1 Methodology:

The researchers adopted a qualitative analytical case study approach, focusing on a recently built school designed along green principles. They analyzed the site and its interior spaces—including ventilation and lighting systems—using environmental assessment instruments, then benchmarked the results against a conventional school of comparable size built during the same period. In parallel, they compared Bahraini building codes with LEED for Schools criteria to pinpoint where the local framework excels and where it falls short.

Four analytical axes guided the study:

a. The building's spatial and solar orientation, aimed at curbing direct heat gain.
b. Natural lighting and ventilation systems and their role in reducing electrical energy dependence.
c. The use of low-carbon building materials coupled with more extensive vegetation.
d. The integration of indoor educational spaces with outdoor environments to strengthen environmental attachment and psychological comfort.

2.1.2 Findings:

The green-designed school outperformed its conventional counterpart on several environmental metrics, particularly energy use and air quality. Energy consumption dropped by roughly 20–25%, largely thanks to the incorporation of natural daylighting strategies.

Indoor air quality saw noticeable gains as well, driven by a planted central courtyard that facilitated air circulation and brought humidity down. Natural light filtering through vertically oriented north- and south-facing openings maintained classroom illumination within visually comfortable ranges. Users of these well-ventilated, well-lit classrooms reported higher satisfaction—and, interestingly, their academic performance improved as well, apparently influenced by the more comfortable environmental conditions.

That said, the study flagged a few shortcomings that still need attention:

a. No continuous monitoring system was in place for thermal or lighting performance after the building went into operation.
b. There was a shortage of technical staff qualified to track compliance with green building standards.
c. Operating budgets allocated for maintaining the newer environmental systems were tight.

2.2 Towards Greener Campuses: Pro-Environmental Behavior at the University of Bahrain (2024)

This study by Alalawi and Omar (2024) explored environmental behavior on the University of Bahrain campus, framing it as an essential ingredient in the push toward green university buildings across the Gulf. Its central premise was that sustainability in higher education cannot stop at building design—it must also encompass the awareness, habits, and everyday practices of the students and staff who actually use the buildings, since these behaviors have a direct bearing on institutional environmental performance.

The researchers observed that, despite commendable strides in green building regulation (Sustainable Energy Authority, 2021), Bahrain still needs to embed a genuine culture of sustainability within its educational institutions. The study thus set out to understand the psychological, social, and contextual factors that shape environmental behavior on campus, and to assess whether user awareness is keeping pace with the sustainable physical fabric of the university buildings.

2.2.1 Methodology:

Multiple methods were employed simultaneously. An electronic questionnaire measured levels of environmental awareness, practice, and behavior. Visual analysis of campus spaces relied on observation and field survey techniques to gauge whether the physical infrastructure—green areas, lighting systems, seating—aligned with sustainability benchmarks. A measurement scale drawn from prior international studies was also used, adapted to fit the Bahraini and Gulf setting. Participants included students and academic and administrative staff.

2.2.2 Findings:

The results paint a mixed picture. Environmental awareness among students and faculty was moderate at best, and a conspicuous gap existed between what people knew and what they did. Over 70% of respondents said they cared about the environment, yet fewer than 35% regularly participated in green initiatives or practiced environmentally supportive behaviors, such as reducing paper use or sorting waste (Alalawi & Omar, 2024).

An unexpected finding was that male respondents displayed somewhat higher commitment to daily environmental practices than their female counterparts. The campus, meanwhile, was found lacking in greenery. The study concluded that turning a campus into a genuinely green facility requires integrating the physical design of the environment with the individual and collective behavior of its users, because a sustainable built environment without active environmental consciousness among occupants does not, on its own, deliver the intended results.

The key recommendations were threefold: embedding sustainability concepts within curricula, establishing a dedicated institutional unit for sustainability and environmental awareness, and setting up a monitoring system to track both environmental and behavioral performance on campus.

2.3 Evaluating Indoor Environmental Quality in a Higher Education Building – Riyadh (2024)

This paper opened with the assertion that Indoor Environmental Quality (IEQ) has emerged as a primary yardstick for evaluating university building performance in hot, arid climates such as Riyadh's. The authors highlighted the outsized share of public-sector energy consumption that educational buildings in Saudi Arabia account for, arguing that improvements in environmental comfort carry direct implications for academic performance, focus, and overall productivity.

What makes this study particularly relevant is the recognition that IEQ is not purely an engineering matter—it is also psychological and cognitive (Alwetaishi et al., 2024). In the Gulf, where outdoor conditions are inhospitable for much of the year, the indoor environment becomes the decisive factor in whether occupants of educational buildings can function comfortably.

2.3.1 Methodology*:*

The researchers set out to assess occupant satisfaction in a modern ~~Riyadh~~ university building, employing the Center for the Built Environment (CBE) IEQ Survey developed at UC Berkeley, a standardized instrument that privileges how people actually experience their spaces over how those spaces were designed on paper (Alwetaishi et al., 2024). Notably, this was the first time such a standardized IEQ instrument had been applied in a Gulf university context. It covered four axes: thermal comfort, lighting quality, acoustic quality, and indoor ventilation quality. A total of 120 users, both genders, participated, and the data were analyzed to identify satisfaction patterns and design shortcomings.

2.3.2 Findings*:*

Results varied across the measured environmental dimensions. Thermal comfort and acoustic quality scored the lowest satisfaction marks, while lighting and ventilation quality fared better (Alwetaishi et al., 2024). This pattern makes intuitive sense in a city as hot and dry as Riyadh, where buildings lean heavily on air conditioning, a dependence that can actually undermine comfort through uneven airflow distribution and the background noise of mechanical plants.

A notable conclusion of the study was that educational building design in the Gulf tends to prioritize "environmental control" rather than "climatic harmony." This distinction underscored the case for developing evaluation systems grounded in how indoor environments actually perform, instead of relying on whether the design on paper ticks the right boxes in engineering building codes.

2.4 Indoor Air Quality in Educational Institutions – Dubai (2024)

This paper by Jung et al. (2024) homed in on a critical yet frequently sidelined aspect of educational building design: Indoor Air Quality (IAQ). The authors explained that educational buildings in Gulf countries like the UAE and Bahrain—where the climate is hot and humid—are typically designed as fully sealed volumes to keep energy costs in check. The trouble is that this approach has had tangible negative consequences for occupant health. Mechanical ventilation on its own, they argued, simply is not enough. The non-stop operation of air-conditioning systems in Gulf schools depresses the rate of natural air exchange, causing gases and pollutants to build up inside sealed classrooms, a phenomenon that, remarkably, had not been systematically documented in the region before.

The researchers noted an important divergence in the literature: Western studies have long examined the links between interior design, air quality, and academic outcomes, whereas Gulf research has remained fixated on thermal comfort and energy metrics (Jung et al., 2024). This study aims to bridge that gap by measuring the air that occupants of educational buildings actually breathe, rather than just recording room temperature.

2.4.1 Methodology*:*

The study took an experimental, field-based approach, running measurements over an entire academic term across three private schools in Dubai that varied in size and classroom density. Specialized equipment tracked key pollutants: CO_2 as a proxy for ventilation adequacy; Total Volatile Organic Compounds (TVOC); formaldehyde; fine particulate matter; and airborne bacteria and fungi. In addition to the instrumental data, the team conducted short interviews with teachers and staff to capture self-reported symptoms associated with indoor environments, such as fatigue, headaches, and eye irritation. Readings were logged at different points throughout the school day. This dual approach—objective measurements paired with subjective reports—yielded findings rooted in the actual daily learning environment rather than in broad-brush estimates.

3 Indoor Environmental Quality and the Ethical Framework for Professional Practice – AIA

It is not possible to talk about indoor environmental quality in educational buildings without also addressing the ethical framework that governs the architect's professional conduct. Design and regulatory choices do not just shape the physical form of a building or its technical performance; their effects reach straight into the health, safety, and everyday wellbeing of the people who use these spaces. It is with this understanding that the present study engages the ethical framework advanced by the American Institute of Architects (AIA)—especially the three interlocking principles of Health, Safety, and Welfare—as a lens for analyzing how indoor environmental quality relates to professional practice in the design of educational settings (AIA, 2014).

a. The health principle starts with the recognition that the built environment is a key determinant of its occupants' physical and mental health—not an inert architectural wrapper. In educational buildings, where students and staff spend long stretches in enclosed spaces, factors like indoor air quality, thermal comfort, and the interplay of natural and artificial light are not nice-to-haves; they are foundational to sustaining concentration, managing fatigue, and supporting daily performance. Seen through this lens, these factors are part of the ethical burden that professional

practice places on the architect: to create environments that do not merely avoid harming health but actively promote it.

b. Safety, in this framework, stretches well beyond the conventional notion of protecting occupants from physical hazards. It extends to the domains of environmental and psychological safety in learning spaces. This means managing noise levels, providing adequate acoustic insulation, and maintaining indoor environmental conditions that are stable enough to minimize stress and cognitive distraction. It is worth noting that excessive noise, or inadequate control of ventilation and temperature, may not always register as clear-cut code violations, yet they accumulate over time and erode occupants' health and their capacity to learn and work effectively. Ignoring these dimensions, then, amounts to a quiet breach of the Safety principle as defined by the ethics of professional practice.
c. Welfare, the third pillar, engages a still deeper layer of human experience in architectural space. It goes beyond baseline comfort to encompass a sense of belonging, psychological steadiness, and the intangible supportiveness that well-designed educational spaces can provide. This shows how the user relates to the space—in the architectural environment's capacity to produce a positive experience through contact with nature, natural ventilation, high-quality light, and a spatial organization that reflects real-world use rather than theoretical assumptions. Understood this way, welfare becomes a substantive criterion for judging design quality on ethical grounds rather than a pleasant side effect of building operations.

The present study puts the AIA ethical framework to work as an analytical instrument: it reads the indoor environmental quality findings in educational buildings through the lens of the architect's professional responsibility and the gap that persists between regulatory texts and actual user experience. In doing so, the research pushes past the notion of ticking compliance boxes and toward a richer understanding of how professional practice can deliver educational environments that are healthy, safe, and genuinely supportive of quality of life—laying the groundwork for a conversation about moving codes and regulations toward performance-based models with real-world measurement indicators.

4 Research Methodology

4.1 Phase One: Theoretical Analysis and Comparative Literature Review

The first phase of the study relied on a comparative theoretical analysis of existing literature as a foundation-laying exercise. The aim was to construct a clear analytical framework within which indoor environmental quality in educational buildings could be read against the climatic, professional, and regulatory backdrop specific to the Arabian Gulf. The focus was on studies investigating the nexus between indoor environmental quality and quality of life in educational environments, with special attention to work conducted in climatic contexts—hot and humid or hot and arid—that mirror Gulf conditions, to ensure the relevance of the indicators used.

This phase did not simply catalog previous findings. It also interrogated the theoretical underpinnings and methodological choices of earlier work, comparing how different studies defined indoor environmental quality—whether as a bundle of measurable technical parameters or as a holistic human experience tied to psychological health, behavior, and the daily functioning of occupants. This unpacking brought to light a clear divide between studies oriented toward compliance with engineering standards and those built around user experience and post-occupancy assessment.

The analysis also charted the environmental indicators that recurred most frequently in the literature—thermal comfort, indoor air quality, and scrutinized how they were measured and what measurements could and could not capture the experience of living in educational buildings. The result was a clearer picture of the distance between raw quantitative indicators and the psychological and perceptual dimensions that regulatory evaluations tend to overlook.

Finally, this phase linked the literature's outputs to the professional dimension by aligning the research recommendations and standards with ethical frameworks for professional practice, above all, the AIA framework. That exercise exposed a clear gap between the theoretical aspirations for occupant health and wellbeing on the one hand, and the actual implementation mechanisms embedded in regulatory codes on the other. This gap set the stage for the transition to fieldwork, where it could be examined through the real experience of users across several educational buildings in Bahrain.

4.2 Phase Two: Field Study Grounded in User Experience

The second phase moved from the desk to the field. Its guiding assumption was that indoor environmental quality cannot be meaningfully assessed solely through technical indicators; it must be linked to how users actually perceive their environment on a day-to-day basis and what that means for their psychological comfort, concentration, and quality of life in educational spaces. To find the answer to the research question, a survey was designed for Google Forms. A targeted questionnaire was designed and distributed to occupants of educational buildings in Bahrain, which are the students, teaching staff, and administrative staff, to capture their actual experience in these buildings, rather than evaluating the design from a hypothetical or normative vantage point. The questionnaire was built around the environmental indicators distilled during the theoretical phase, reformulated in everyday language that respondents could engage with, so that technical concepts were converted into questions about lived, daily experience.

The questions probed whether users felt thermally comfortable during the day, whether they could control aspects of their environment (ventilation, window opening), and how they rated the quality of both natural and artificial lighting, as well as noise and acoustic insulation within classrooms and offices. A psychological dimension was woven in as well, exploring the impact of the architectural environment on mood, comfort, and a sense of belonging—grounded in the idea that indoor environmental quality does not end at functional performance but extends to the user's relationship with the place itself.

In designing the questionnaire,

- Care was taken to ensure that every group of items served one of the three research questions rather than leaving the survey as a loose catalog of user opinions.
- The opening section collected basic demographic information: gender, age bracket, and daily time spent inside the building.

The point of including these was not statistical, but to ensure the sample we were listening to actually spent meaningful time in educational buildings.
So, two-thirds of the respondents reported being indoors for more than six hours a day, which provided some confidence that their answers reflected genuine daily experience rather than occasional visits.
Consequently, the research questions were designed as follows:

- The first research question asks how far the existing regulations in Bahrain actually translate into decent indoor conditions and psychological wellbeing inside schools and universities. To answer that, the questionnaire was organized around the same four environmental domains: thermal comfort, indoor air quality, lighting, and acoustics. These domains were situated at the heart of the AIA Chapter Thirteen framework and of Bahrain's Green Building Guide (v2.3). Under thermal comfort, users were asked whether the temperature felt appropriate throughout the day. Under air quality, the items looked at whether air movement felt sufficient, whether they noticed stuffy air or unpleasant smells, and whether good ventilation helped them focus. The lighting questions covered natural daylight, the comfort of artificial lighting, and whether users would prefer larger windows. The acoustic questions asked about noise from corridors and outside, the adequacy of sound insulation, and whether noise interfered with concentration and productivity. Organizing the items this way was not accidental: it meant the responses could be read directly against the very regulatory categories the paper is trying to evaluate.
- The second research question is about the mechanisms that would be needed to push Gulf educational buildings toward a performance-based approach to design and operation. For this, a small but important group of items focused on environmental control: whether users could adjust the temperature, open a window when needed, and whether the air movement inside felt sufficient. These may sound like simple questions, but they carry real weight. Whether a user can modulate their own surroundings is often the clearest indication of whether codes have genuinely moved beyond prescriptive minimums, or whether the building is still run by centralized mechanical systems that pay little attention to the people inside.
- The third research question concerns how the findings themselves could eventually feed into a regulatory oversight mechanism that blends quantitative indicators with qualitative ones. Two groups of items were written with this in mind. The first explored the psychological side of the experience, asking whether natural elements such as plants or natural ventilation affected how users felt, whether the building's architectural environment shaped their mood, and whether they felt a sense of belonging in the space where they study or work. The second asked users to name the single element they most wanted to see improved inside their buildings, with noise and acoustic insulation, thermal comfort, and ventilation, and lighting offered as options; a follow-up item asked whether improving lighting, ventilation, and shading would, in their view, raise the quality of life on campus. These items matter because they take what is usually dismissed as subjective impression and turn it into something ordered and actionable, the kind of indicator a supervisory body can actually use when reviewing codes, running post-occupancy assessments, or revising operational standards.

Distribution was electronic to maximize accessibility. Twenty-seven respondents participated; all responses were voluntary and anonymous, and the data were used strictly for academic purposes. It should be noted that this sample size was not intended to support sweeping statistical generalizations. Its purpose was exploration: to capture broad trends and user experience within a specific local educational context.
The data gathered in this phase served as an analytical springboard for what followed. Field findings were treated as an interpretive resource for reading the state of indoor environmental quality in educational buildings, linking those readings to the ethical framework of professional practice and to the extent to which regulatory codes actually show up in users' daily lives—opening the door to a deeper discussion of how far existing systems go and where they hit their limits.

5 5.Field Study Results

5.1 Sample *Characteristics*

Twenty-seven people responded to the questionnaire. The overwhelming majority—96.3%—were female. In terms of age, participants were spread across three brackets: under 25, 25 to 35, and over 35, with the last group making up the largest share at 51.9%. A full 66.7% reported spending upwards of six hours each day inside educational buildings—a figure that underlines the sheer volume of time occupants are exposed to indoor conditions and makes the quality of that indoor environment all the more consequential.

5.2 Thermal *Comfort and Environmental Control*

Sixty-three per cent of respondents indicated that the temperature inside classrooms or offices feels inappropriate at some point during the day, with only 37% reporting consistent thermal comfort. On the control front, 44.4% said they are unable to adjust the temperature or open windows when needed, while 55.6% reported having some degree of environmental control. The picture that emerges is one of clear unevenness in how much agency users have over their own thermal environment, and of substantial dependence on centralized mechanical systems that may not accommodate individual preferences or the shifting conditions of a typical school day.

5.3 Ventilation *and Indoor Air Quality*

When it came to indoor air movement, opinions were nearly split: 51.9% of respondents felt air circulation was insufficient, while 48.1% found it adequate. What was striking, though, was the near-universal recognition of ventilation's

importance: 96.3% agreed that good ventilation helps them concentrate and feel at ease. This suggests a keen awareness that the air they breathe directly affects mental and psychological performance. On a related note, 74.1% reported occasionally encountering unpleasant smells or stuffy, stale air indoors—a finding that brings the issue of indoor air quality into sharp relief as something occupants tangibly experience day after day.

5.4 Natural *and Artificial Lighting*

More than half the respondents—55.6%, said they do not get enough natural light in their classrooms or offices during the day; 44.4% felt the daylight was adequate. Views on artificial lighting were similarly divided: 48.1% found it uncomfortable for studying or working, while 51.9% were satisfied. What stood out most was the overwhelming preference—96.3%—for larger windows admitting more natural light. That kind of consensus speaks to a collective intuition about how much natural daylight matters for both visual and psychological comfort.

5.5 Noise *and Acoustic Insulation*

Noise emerged as perhaps the most acutely felt problem. A full 88.9% of respondents described noise inside the building—from corridors, from outside—as bothersome, and 81.5% felt that the design of their classrooms or offices does not provide adequate sound insulation. Even more telling, 92.6% acknowledged that noise directly affects their concentration or output. Taken together, these figures suggest that acoustic conditions are, from the user's perspective, one of the weakest links in the chain of indoor environmental quality.

5.6 Psychological *Impact and Sense of Belonging*

On the psychological front, 92.6% of respondents said that the presence of plants or natural ventilation in a space helps improve their sense of comfort. An identical 92.6% confirmed that the architectural environment of their educational institution affects their psychological state. Yet 63% reported not feeling fully comfortable or a genuine sense of belonging in the building where they study or work. These numbers throw into relief just how much the psychological dimension of the architectural environment matters—no less, really, than the technical side.

5.7 Improvement *Priorities from the Users' Perspective*

Asked what single element most needs improving inside educational buildings, respondents ranked noise and acoustic insulation first (40.7%), followed closely by temperature and ventilation (37%), and then lighting (22.2%). These rankings offer a window into what users themselves perceive as the factors most heavily shaping the quality of their daily educational experience.

6 Discussion and Conclusions

Taken as a whole, the field results make one thing abundantly clear: indoor environmental quality in educational buildings is not reducible to whether a set of regulatory boxes has been checked or whether certain technical systems are in place. It is a cumulative, lived experience—one in which heat, air, light, and sound interact to shape concentration, mood, and the feeling of being comfortable and at home in a space. Read this way, the findings expose a real gap between a regulatory framework built around formal compliance and the tangible impact of those codes on

a. people's quality of life in educational environments.
   - On thermal comfort and indoor air quality, the picture is telling. The heavy reliance on sealed mechanical systems—seemingly in line with energy and efficiency targets—has, in practice, not delivered a stable and comfortable indoor climate for users. That a substantial share of respondents is unhappy with indoor temperature throughout the day, and that many lack the ability to adjust ventilation or open a window, points to educational settings that lock occupants into fixed environmental conditions with no room for individual variation or for the natural fluctuations of a school day. This chimes with recent Gulf scholarship arguing that comfort in hot, humid climates cannot hinge on air conditioning alone—it calls for more supple design and operational strategies attuned to local realities.
   - The indoor air quality findings are equally instructive. Users are clearly attuned to the link between good ventilation and their ability to concentrate and feel psychologically well. Air quality, in other words, is not some invisible technicality, it is a felt presence in people's daily routine. The fact that so many respondents report stuffy or malodorous air at certain points in the day signals that indoor air quality monitoring has yet to be folded into post-operation oversight, even though it is fundamental to occupant health. The implication is clear: relying on the design phase alone is not enough. Continuous measurement and monitoring need to be built into the evaluation and operations cycle.
   - Noise and acoustic insulation emerged as the most problematic dimension. The sheer proportion of users who find noise disruptive and who report that it eats into their concentration and productivity reveals a failure to treat sound as a core functional parameter rather than a peripheral comfort issue. These numbers suggest that the concept of safety in educational buildings should not be limited to conventional physical hazards; it must also encompass cognitive and psychological safety. Sustained exposure to noise has a cumulative cost that chips away at learning and working inside educational spaces.
   - In the lighting domain, the data reveals heavy reliance on artificial light and underuse of daylight, despite a near-unanimous desire for bigger windows and more natural light. Natural lighting, it appears, is perceived by users not merely as a matter of illumination levels but as something that colors their visual comfort and psychological state. This aligns with what the literature has long suggested: that natural light is a cornerstone of quality of life in educational environments, particularly where occupants are indoors for extended periods.

b. Psychologically,

- The results leave little room for doubt. The architectural environment itself shapes mood, comfort, and a sense of belonging. A large share of respondents explicitly said as much, highlighting the positive contribution of natural elements to their in-building experience.
- At the same time, the fact that a sizeable minority do not feel they belong in their educational buildings suggests that these environments, while meeting baseline functional requirements, are failing to forge a positive spatial relationship with the people who use them, a relationship that quietly erodes quality of life.

Mapping these results onto the AIA ethical framework brings the larger picture into focus. The gap is not purely regulatory. It extends to translating the ethical principles of health, safety, and welfare into concrete, measurable, and verifiable on-the-ground outcomes. Without post-occupancy evaluation tools, and with only a weak thread connecting user experience to regulatory codes, the system continues to churn out educational environments that clear the minimum compliance bar but do not reliably deliver the positive health and wellbeing outcomes that the codes were presumably designed to secure.

The user-identified improvement priorities only reinforce this reading. Users know firsthand which elements matter most to their daily lives—and noise, thermal comfort, and ventilation sit at the top of their list. This points to an urgent need to realign legislative and design priorities around actual performance rather than paper-based assumptions. The message is that a transition to a performance-based regulatory system must embed user experience in the evaluation process and tie survey and field study data to the evolution of codes, inspection protocols, building operations, and assessment.

The conclusion, then, is that improving indoor environmental quality in educational buildings—in Bahrain and the Gulf more broadly—will not come from updating regulatory texts alone. It demands a fundamental rethinking of the relationship between legislation and practice, one in which psychological health indicators, environmental comfort, and user experience become explicit, non-negotiable components of the regulatory and evaluative process. This study confirms that a shift toward performance-based approaches—backed by field-measurement tools and post-occupancy evaluation—is an indispensable step toward educational environments that are genuinely humane and capable of supporting the quality of life of the people in them.

7 Regulatory Recommendations for Developing Educational Building Codes in Bahrain and the Gulf

Drawing on field findings and the gap they revealed between regulatory compliance and user experience quality, the following set of regulatory recommendations is proposed. The aim is to move educational building codes from a prescriptive, minimum-threshold framework to one grounded in

a) performance outcomes and quality of life:
   - Embed indoor environmental quality performance indicators directly into building codes and regulations. Evaluation should not stop at confirming that systems exist; it should assess their real-world outcomes in terms of thermal comfort, air quality, and noise, tied to explicit performance thresholds that can be measured and revisited after a building is in operation.
   - Bolster user environmental control requirements in educational spaces by stipulating provisions that allow varying degrees of control over ventilation and temperature—respecting individual differences and the rhythms of daily use—rather than defaulting to centrally managed, fully enclosed mechanical systems that ignore user experience.
   - Broaden the definition of safety in educational buildings to encompass auditory and psychological safety. This means tighter acoustic insulation standards between classrooms and corridors, better control of both internal and external noise sources, and explicit acknowledgement that the impact of noise on concentration and productivity is part of the functional safety of the educational environment.
   - Elevate natural lighting to a regulatory priority in educational building design codes, specifying appropriate glazing ratios, addressing spatial depth, and ensuring balanced distribution of daylight—rather than simply relying on artificial lighting to make up the deficit—given its direct bearing on visual comfort and psychological state.
b) psychological
   - Fold psychological wellbeing requirements into regulatory codes so that they are treated not as optional extras or aesthetic touches but as core components of indoor environmental quality. This includes encouraging the integration of natural elements, natural ventilation, and spatial configurations that promote comfort and a sense of belonging in educational settings.
c) Make Post-Occupancy Evaluation (POE) a mandatory or at least strongly recommended phase in the lifecycle of educational buildings. Survey results and actual performance data should inform reviews of design and operational effectiveness and be used to update codes and improve existing buildings.
d) Move away from a one-size-fits-all code system toward a more flexible, context-sensitive approach that accounts for local climatic conditions, actual patterns of use, and the specific needs of the communities served by educational buildings—rather than applying generic templates that bear little resemblance to users' daily reality.
   Reinforce the architect's role as a professional steward of quality of life inside educational buildings by linking regulatory compliance to the principles of professional ethics. The pursuit of health, safety, and welfare should be understood as an integral part of professional responsibility—not as a set of regulatory obligations that exist in isolation from user experience.

Collectively, these recommendations point to the need for a philosophical shift in how educational building codes are conceived—from a compliance-centered mentality to a performance-centered one that places user experience at its heart, ensuring that the ethical principles of professional practice are reflected, tangibly and measurably, in the quality of life inside educational environments.

8. Conclusion

This study has arrived at a central finding: indoor environmental quality in educational buildings is neither a narrow technical question nor a standalone regulatory checkbox. It is a core determinant of occupants' daily experience—shaping their psychological health, concentration, and sense of comfort and belonging. By bringing together a literature review and a field survey, the research has shown that the real problem is not the absence of codes and standards but their limited real-world resonance inside the educational spaces they are supposed to govern.

Survey respondents did not experience thermal comfort, air quality, lighting, and acoustic insulation as separate compartments; they experienced them as a single, interconnected environmental reality that shapes how they perform and how they feel on any given day. The study has demonstrated that leaning on formal code compliance does not, on its own, guarantee a healthy, safe, or welfare-enhancing educational setting—particularly when post-occupancy evaluation is missing, and the bridge between legislation and real user experience is fragile.

Viewed through the AIA's ethical framework for professional practice, the challenge comes into sharper relief. It is not just about lifting the environmental performance of educational buildings; it is about redefining the architect's accountability as a professional actor charged with converting the principles of health, safety, and welfare into an architectural reality that can be measured and evaluated. This underscores the need for regulatory approaches that are more adaptive, performance-driven, and responsive to local conditions and actual patterns of use.

The study argues that the development of educational building codes in Bahrain—and across the Gulf—calls for a shift in regulatory philosophy: from fixating on minimum thresholds to placing user experience and quality of life at the center of decision-making. It also underscores the value of integrating field-based evaluation tools and user feedback throughout the building's lifecycle, so that both existing educational environments and those yet to be built can be improved in more humane and sustainable ways.

In this way, the research contributes to a growing conversation about the role of professional practice in elevating indoor environmental quality in educational buildings. It provides a platform for future studies to expand the measurement toolkit, broaden sample sizes, and trace the connections between indoor environmental quality and educational and behavioral outcomes over the longer term.

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Conflicts of Interest

The Authors declared that there is no conflict of interest.

Data Availability Statement

The survey Questionnaire Data can be obtained on request from the authors.

Credit Author Statement

Conceptualization of study: F.M.; drafted the manuscript: F.M.; Methodology: F.M.; Analyzed data: F.M.; Provided results and Discussion: F.M.; Supervised the study: I.E.; Reviewed and edited the final manuscript: I.E. All authors read and approved the final version of the manuscript.

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