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FROM TRANSIT TO INTERACTION: DESIGN STRATEGIES FOR HIGH-DENSITY SCHOOL CORRIDORS

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High-density primary schools increasingly assign corridors dual roles, requiring them to support daily circulation and emergency egress while accommodating recess-time informal learning under limited outdoor space. This paper proposes a conceptual typological framework for corridor retrofits, synthesizing three recurring spatial strategies: Boundary Thickening, Nodal Expansion, and Visual Permeability with Guidance Coding. The framework clarifies how each strategy can decouple fast movement from short-duration staying, helping to maintain wayfinding clarity and circulation safety in space-constrained educational environments.

Key words: high-density schools; corridor retrofit; informal learning spaces; wayfinding; cognitive load; inclusive design.

INTRODUCTION

As urban densification increases building compactness in many primary schools, outdoor land frequently becomes insufficient for recess activities. Consequently, corridors assume more than a mere circulation function, because corridors must support both fast movement and short recess-time interactions within the same constrained footprint.

Prior research has heavily emphasized wayfinding and evacuation performance in high-FAR school buildings. For instance, Zhang and Liu (2024) discussed traffic-space cognition in high-density primary schools [1], while Cao et al. (2025) recently demonstrated how spatial organization patterns directly impact evacuation efficiency [2], with both studies treating these factors as baseline requirements. Concurrently, a second line of work examines corridors as part of a broader learning ecology. Sailer (2018) linked school layout and circulation to everyday learning practices, positioning in-between spaces as vital carriers of informal learning [3]. Furthermore, inclusive design introduces additional constraints to corridor retrofits. Students with sensory sensitivities may experience discomfort under crowding and high noise. Al-Harasis (2025) proposed a taxonomy of sensory-informed architectural qualities for autism-oriented design [4]. These discussions motivate low-stimulus options within everyday school environments. Ultimately, this paper asks how corridor retrofits can help reduce the conflict between fast transit and slow interaction in high-density primary schools.



PURPOSE

This study aims to synthesize transferable corridor retrofit strategies for high-density primary schools. This study presents a conceptual framework rather than a systematic review. The framework abstracts three recurring spatial moves: Boundary Thickening, Nodal Expansion, and Visual Permeability with Guidance Coding. The analysis explains how each move can separate circulation from recess-time staying while supporting wayfinding clarity and traffic safety.

RESULTS AND DISCUSSION

This research frames the corridor dilemma as an affordance conflict. While transit benefits from linear paths, clear sightlines, and unobstructed clearways, recess-time interaction thrives on edges, micro-spaces, and cues that support safe stopping. Accordingly, the analysis synthesizes three strategies that address this inherent tension through distinct morphological operations (Fig.1).

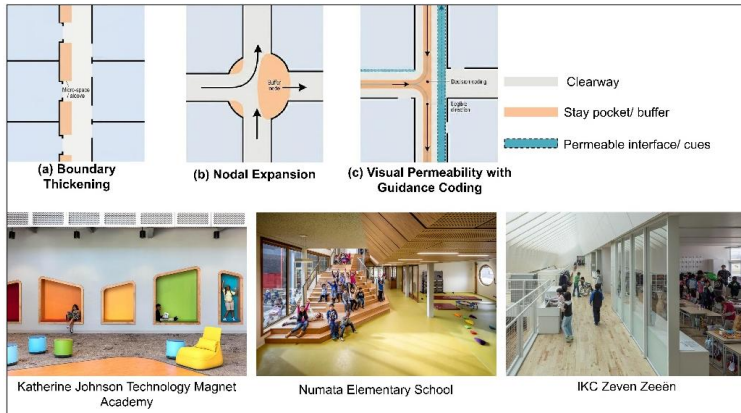


Fig. 1. Typological strategies for hybrid corridors with representative cases
(Source: ArchDaily project pages)

Boundary Thickening and Micro-spaces. Boundary Thickening modifies the corridor edge through recessed alcoves, window seats, and built-in niches. This intervention preserves the central clearway while introducing functional micro-spaces within the boundary depth. Consequently, the strategy supports short-duration edge activities—such as reading, brief conversations, and waiting—without impeding traffic.

From an inclusive design perspective, as discussed by Altenmüller-Lewis, these micro-spaces can function as sensory buffers. The buffers can provide retreat points for sensory-sensitive or neurodivergent students during peak circulation. The buffers may reduce perceived overstimulation while keeping the retreat within supervised sightlines. This morphological shift can reduce friction between passing flows and staying activities. The edge absorbs slow behaviors. The center preserves its movement capacity.



Nodal Expansion at Intersections. Nodal Expansion enlarges selected points along the circulation system, including corners, intersections, and stair landings, to introduce local buffers at typical conflict zones. By providing spatial slack for brief stops, this strategy effectively mitigates contact between crossing flows and short gatherings. Furthermore, it strengthens orientation by transforming the expanded node into a recognizable landmark, which is crucial for children relying on salient reference points for navigation, aligning with Zhang and Liu's findings on traffic-space cognition.

Drawing from environmental behavior research, which links crowding to proxemic stress in narrow passages, the expanded node increases interpersonal distance and reduces contact pressure. Additionally, these nodes can employ territorial cues—such as flooring or ceiling shifts—to define soft boundaries without hard partitions, safely hosting small exhibitions and group activities outside the primary clearway.

Visual Permeability with Guidance Coding. This strategy modifies interfaces and navigation cues at the corridor scale. Introducing transparent or perforated partitions enhances visual permeability, which improves supervisory sightlines and reduces perceived confinement. Complementing this, guidance coding applies continuous color or graphic cues at child-centric heights and critical decision points.

Recent computational studies have explored links between campus spatial features and child-related outcomes [5]. The cue system also addresses the elevated cognitive load inherent to high-density transitions. A continuous and restrained coding scheme can reduce search effort at decision points. Designers should calibrate cue intensity, saturation, and graphic density to avoid visual overload.

These three strategies share a unifying logic: decoupling movement from staying within severely constrained footprints. Boundary Thickening relocates stationary activities to edge micro-spaces, protecting the central clearway; Nodal Expansion confines short gatherings to buffered nodes, reducing intersection friction; and Visual Permeability with Guidance Coding strengthens environmental cues, supporting rapid orientation.

Consequently, this framework treats inclusion as a fundamental spatial requirement, ensuring sensory-sensitive students have access to low-stimulus options within supervised sightlines. It also repositions safety as an active design variable rather than a mere management issue, proactively preserving clearways and reducing navigational hesitation. Because this typology relies on micro-scale spatial reallocation rather than expanding floor area, it powerfully prioritizes spatial efficiency for stock renovation in high-density contexts.

CONCLUSIONS

High-density primary schools impose competing demands on corridors, requiring them to support both rapid circulation and recess-time informal learning within strictly limited footprints. To address this, this paper proposes a conceptual typological framework comprising three strategies: Boundary Thickening, Nodal Expansion, and Visual Permeability with Guidance Coding. This framework



demonstrates how targeted morphological interventions can successfully separate movement from short-duration staying while upholding wayfinding clarity and traffic safety. Future research should validate these strategies through quantitative evaluation, utilizing agent-based modeling and social digital twin workflows to assess pedestrian flow, localized crowding, and contact risk under peak-use conditions.

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ВІД ТРАНЗИТУ ДО ВЗАЄМОДІЇ: ДИЗАЙНЕРСЬКІ СТРАТЕГІЇ ПЕРЕТВОРЕННЯ КОРИДОРІВ НА НЕФОРМАЛЬНІ НАВЧАЛЬНІ ПРОСТОРИ В ПОЧАТКОВИХ ШКОЛАХ ВИСОКОЇ ЩІЛЬНОСТІ

Високощільні початкові школи дедалі частіше надають коридорам подвійну роль: вони мають забезпечувати щоденну циркуляцію та евакуацію в разі надзвичайних ситуацій, водночас підтримуючи неформальне навчання під час перерв за умов обмеженого зовнішнього простору. У цій роботі запропоновано концептуальну типологічну рамку для модернізації коридорів, що узагальнює три повторювані просторові стратегії: ущільнення межі (Boundary Thickening), розширення вузлів (Nodal Expansion) та візуальну проникність із навігаційним кодуванням (Visual Permeability with Guidance Coding). Рамка пояснює, як кожна стратегія може роз'єднувати швидкий рух і короткочасне перебування, допомагаючи зберігати чіткість орієнтації та безпеку циркуляції в освітніх середовищах з обмеженим простором

Ключові слова: школи високої щільності; модернізація коридорів; неформальні навчальні простори; орієнтування в просторі; когнітивне навантаження; інклюзивний дизайн.