

Expanding Problem Framing in Architectural Design Education through the Lens of the Production of Space (Case Study of a Stair-Design Exercise)

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Detailed abstract

Introduction

Introductory architectural design studios develop students' representational skills, formal exploration, and ability to frame problems. Although limited exercises help teach fundamental concepts, isolating an element from its context and everyday use may promote self-contained form-making. A stair exercise can teach circulation, level change, human proportions, and composition; yet if the stair is understood only as a connection between elevations, the problem may remain confined to variations of one element. The challenge is to situate form-making within relationships involving body, movement, ground, context, and use.

Design learning is a nonlinear, iterative process of problem framing and reframing, option generation, critique, and revision. Experiential approaches emphasize direct engagement with environments, observation, inquiry, and everyday practices. However, recognizing additional conditions does not ensure that students can organize them architecturally; concerns such as pause, gathering, view, or context may remain spatially incoherent.

This study examines Architectural Design I at Shahid Beheshti University, where twelve undergraduates designed a stair connecting a U-shaped faculty courtyard to its roof. The site contained trees, level differences, and surrounding facades. Initial proposals, despite formal diversity, largely treated the stair as autonomous. Students then observed everyday stair uses in university, public, and social settings and discussed movement, sitting, waiting, gathering, privacy, shade, and view. No preferred form was prescribed; the aim was to broaden the relationships included in the problem.

Henri Lefebvre's theory of the production of space interprets this shift. It challenges space as a neutral container and understands it as relationally produced through material organization, practices, representations, and lived meanings. The theory was neither taught to students nor used as a predetermined coding scheme; it was introduced after empirical patterns emerged. The study asks how this experience was associated with expanded problem framing, how expansion appeared in final works, and how the theory clarifies the difference between recognizing relationships and translating them into architectural organization.

Materials and Methods

The research employed an exploratory qualitative case study and cross-case analysis of twelve students' design products. Quantitative expert ratings were complementary and descriptive; this was neither a pretest-posttest experiment nor a causal study. Because the studio operated alongside parallel groups and shared some critiques, the experience was not fully isolated from other activities.

Stair and open-space assignments were combined within the courtyard. Students initially explored ideas through models and reference images, then observed stair use and discussed activities beyond ascent and descent. Retaining trees and connecting courtyard to roof were mandatory; broader interventions could include paths, edges, level changes, open or semi-enclosed spaces, and the zone between ground and roof. Each submission

comprised a physical model and two hand-drawn 50 × 70 cm boards with drawings, ideograms, site analysis, and perspectives.

Final models and boards provided direct evidence of spatial organization; teaching participation, discussions, and observations supplied indirect contextual evidence. Since complete preliminary materials were unavailable, they could not demonstrate changes in mental processes. “Expanded problem framing” was operationalized as the increased range of relationships inferable from final works and decisions, not as a direct measure of cognition.

Exploratory analysis began with three works and was refined across all twelve projects. Six components were established: expansion of the intervention territory; transformation of functional movement into spatial sequence; capacity for pause, presence, and use; level change as a generator of space; active integration with contextual conditions; and relational integration of elements. The mere presence, size, number, or formal complexity of elements was insufficient; an element was meaningful only when it participated in an intelligible spatial relationship.

Seven architecture academics independently reviewed anonymized images of all models without access to names, boards, or instructor assessments. They rated the six components on a five-point scale and answered a separate overall question about transformation from an isolated element into broader spatial organization. Spearman’s correlation compared the composite score with the overall judgment, and Kendall’s coefficient assessed evaluator agreement. Projects 1, 4, and 6 were purposively selected to illuminate contrasting relationships between framing and spatial legibility, not as statistically defined groups. Lefebvre’s theory was applied only after empirical patterns were established.

Findings

The projects moved beyond the minimum definition of a stair connecting courtyard and roof to varying degrees. Many incorporated the ground plane, trees, horizontal paths, edges, elevated surfaces, intermediate spaces, and potential opportunities for pause and view. The principal variation concerned not the scale or formal complexity of intervention but the quality, integration, and legibility of spatial relationships. Composite expert scores ranged from 2.79 to 3.93 out of five, with an overall mean of 3.36. Level change as a generator of space received the highest component mean (3.61), whereas transformation of functional movement into spatial sequence received the lowest (3.18).

Expansion of the intervention territory appeared when ascent extended through platforms, bridges, elevated surfaces, modified ground planes, and the zone between courtyard and roof. Project 1 clearly translated experiential concerns into architecture: its stair, bridge, platforms, elevated surface, and roof connection formed a readable multilevel sequence, while the boards addressed shade, view, pause, sitting, and gathering. Level change became more than a technical obstacle and shaped intermediate stopping points and conditions between movement and rest.

Project 4 produced a more localized and multicentric organization. Raised and recessed surfaces, short stairs, curving walls and frames, multiple routes, and relationships with trees made the courtyard itself the primary design material. Several conditions for passage, sitting, stopping, threshold, and partial enclosure were visible, although their integration into a comprehensive system was less evident. Project 6 revealed the clearest gap between intention and architectural translation. Its board included a gathering area, tiered seating, multiple routes, and several levels, demonstrating broader recognized requirements; however, these relationships were less legible as a unified organization in the model reviewed by independent experts.

Across the cases, level change shifted from a problem to be overcome into a means of producing space. Movement, however, did not consistently develop from destination-oriented circulation into a sequence of direction changes, horizontal passages, pauses, and spatial experiences. The findings thus distinguish three related levels of learning: admitting a wider set of relationships into the problem; organizing them through physical and spatial decisions; and making that organization legible to another observer.

The composite component score correlated strongly with the separate overall judgment (Spearman’s $\rho = 0.885$, $p < 0.001$), indicating broad alignment between the detailed and holistic assessments. Agreement among the seven

evaluators was nevertheless limited and statistically nonsignificant at the 0.05 level (Kendall's $W = 0.242$, $\chi^2(11) = 18.65$, $p = 0.068$). The scores therefore support exploratory description rather than statistical generalization or definitive validation of the components.

Discussion and conclusion

The observed change is best understood as an increase in relationships entering the design problem rather than greater formal complexity. In more relational works, the stair acquired meaning through its connections with ground, route, height, trees, platforms, roof, view, and possible modes of presence. Lefebvre's theory interprets this development as contextualized form-making: form remains essential but is produced in response to a wider field of material, practical, and potentially experiential relations. The analysis neither equates early formalism with Lefebvre's "abstract space" nor claims that unbuilt projects constitute lived space; it concerns designed capacities, not observed appropriation or actual behavior.

The central pedagogical conclusion is that expanded problem framing and architectural translation are related but distinct capabilities. Assessment based only on students' explanations may mistake stated concepts for spatial realization, whereas assessment based only on final products may overlook meaningful development in problem framing that has not yet been translated coherently. Introductory exercises should cultivate both the recognition of relationships and the ability to prioritize, integrate, and communicate them through routes, levels, boundaries, intermediate spaces, and contextual connections.

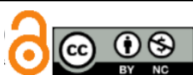
A limited element-based exercise need not become programmatically complex to encourage relational thinking. Observing everyday use can broaden attention while preserving instruction in form, proportion, circulation, and construction. This also informs open-space design education by relating architectural elements to ground, vegetation, movement, pause, boundary, and presence.

The findings remain bounded by one studio, twelve students, the absence of a comparison group, and incomplete pre-intervention and post-intervention documentation. The instructor-researcher role introduced possible interpretive bias, which independent review could only partly address. Limited evaluator agreement also shows that judgments about spatial transformation retain an interpretive dimension. Because the projects were unbuilt, conclusions concern potential rather than realized use. Future studies should document several design stages, compare multiple studios or control groups, distinguish intention from spatial legibility and actual experience, and, where feasible, observe temporary or full-scale interventions in use.

Declarations

All student names and identifying information were removed from the analyzed and reproduced educational materials. ChatGPT (OpenAI) was used only to assist with language editing, textual organization, indexing, and limited image restoration, including name removal and adjustments to color and lighting. All scientific analyses, interpretations, conclusions, and responsibility for the final content remain with the author.

Keywords: Architectural Education; Design Process; Henri Lefebvre; Production of Space; Spatial Organization



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