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Design-Anchored Pedagogy: Reconciling Macro-Governance and Micro-Design in Territorial Spatial Planning Education

Huiyan Zhao*, Huiyu Chen

School of Civil Engineering and Architecture, Wuhan Polytechnic University, 430023 Wuhan, China

Abstract: China's integrated Territorial Spatial Planning (TSP) system exposes a critical disconnect in architecture education: students struggle to operationalize macro-governance logic into micro-design actions under traditional "theory-before-design" pedagogies. This paper proposes a Design-Anchored framework that repositions design practice as the primary driver for knowledge acquisition. The model employs a "reverse linkage" mechanism where specific design tasks retroactively activate and filter essential planning knowledge. Grounded in a live campus renewal project within a third-year course, this reform shifted student cognition from passive compliance to active, constraint-responsive optimization. Empirical results demonstrate that students internalized planning constraints as generative parameters, effectively translating abstract policies into tangible spatial strategies. Ultimately, this paradigm reconciles the macro-governance vision of territorial planning with the micro-spatial agency of architectural practice.

1 Introduction

China's reform of integrated multi-plan coordination accelerates the establishment of a unified Territorial Spatial Planning (TSP) system as the foundation for high-quality development [1]. This shift necessitates recalibrating architectural competencies: future architects must transcend mere form-making to interpret multi-scalar governance logic and operationalize strategic policies within design interventions.

However, a critical misalignment persists. While "Urban and Rural Planning" courses are standard, they often remain disconnected from core design studios. Treated as theoretical prerequisites, they frequently fail to equip students with tools to translate abstract TSP constraints into generative drivers. Consequently, students perceive planning requirements as external restrictions rather than creative opportunities, inherently fragmenting spatial design proposals from territorial governance realities.

To bridge this divide, this paper proposes a Design-Anchored pedagogical framework. By embedding TSP logic directly into the design studio, this approach reconfigures the traditional course from a passive lecture on regulations into an active laboratory for spatial translation. The goal is cultivating a planning-conscious mindset, enabling students to negotiate the tension between macro-strategy and micro-form. Ultimately, this framework empowers architects to synthesize governance logic with spatial creativity, producing designs that are both aesthetically compelling and strategically compliant. This represents a fundamental shift from a "theory-before-design" model to a "design-anchored" paradigm.

2 Connotation and Mechanism of the Design-Anchored Philosophy

2.1 Theoretical Basis

The Design-Anchored philosophy integrates five theoretical frameworks to align with architecture students' preference for learning by doing (Table 1). By combining the spatial contextualization of Constructivism and the Science of Human Settlements with the cognitive efficiency of Cognitive Load Theory, this approach translates abstract policies into tangible design parameters. Furthermore, guided by Backward Design and Competency-Based Education, the framework transforms regulatory constraints into generative drivers, fostering intrinsic motivation through authentic practice.

Table 1. Theoretical Foundations of the Design-Anchored Teaching Philosophy

Theoretical Basis	Main Viewpoints
Constructivism [2]	Actively constructing knowledge within authentic design contexts
Backward Design [3]	Starting with the end in mind to filter core knowledge based on competency goals
Competency-Based Education [4]	Focusing on practical skills required for professional practice
Cognitive Load Theory [5]	Eliminating redundant information to focus on "useful" knowledge chains
Science of Human Settlements	Bridging macro-planning constraints with micro-architectural design

* Corresponding author: huiyanz@whpu.edu.cn

2.2 Knowledge Stratification

Given the breadth of TSP content, pedagogical approaches must move beyond the impractical goal of "comprehensive coverage"[6]. To this end, a three-tiered objective framework is proposed to categorize specific content as follows:

- **Cognitive Level (Fundamental):** Establishes the foundational framework. For example, understanding TSP's legal hierarchy, the "Five-Level and Three-Type" system, and the "Three Zones and Three Lines" policy.
- **Interpretative Level (Connecting):** Focuses on transmission mechanisms. For example, analyzing how higher-level plans impact plot development, and interpreting how Regulatory Detailed Planning guides and controls urban spatial development.
- **Applicative Level (Actionable):** Requires direct application to design. For example, decoding upper-level plans and regulatory provisions for a specific site, calculating site-specific Floor Area Ratio (FAR) and building density, and translating them into volumetric massing.

This structure enables the strategic allocation of teaching resources across all three levels, optimizing limited instructional hours to cultivate students' praxis-oriented competencies.

To illustrate this stratification in practice, we can consider the pedagogical approach to the concept of FAR. At the Cognitive Level, students learn FAR's legal definition in TSP and its function in regulating development intensity. At the Interpretative Level, they analyze how urban strategies such as transit-oriented high-density development guide the site FAR specified in regulatory detailed plans. At the Applicative Level, students are tasked with calculating the maximum allowable gross floor area and making iterative decisions on building massing, height, and footprint to optimize FAR while balancing other constraints like green space ratios and sunlight access. This example shows how one planning indicator is disassembled and reconstructed across the three tiers.

To systematically visualize this progressive hierarchical teaching framework, a three-tier objective system is summarized as shown in Fig. 1.

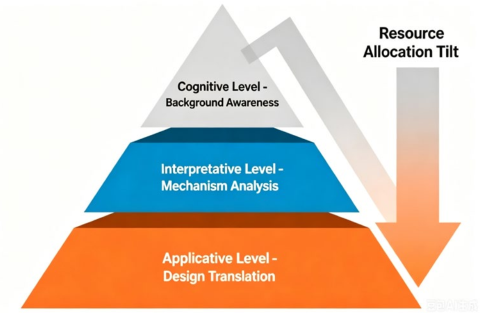

Fig. 1. Three-Tier Objective System for Territorial Spatial Planning Education.

Note: Under design-anchored pedagogy, teaching resources are tilted toward the applicative layer of design translation.

2.3 Reverse Linkage Mechanism

Based on the three-tier knowledge stratification framework shown in Fig. 1, this section further explains the core operational logic of reverse linkage. The core operational mechanism of the Design-Anchored approach is "reverse linkage", a process that derives knowledge acquisition directly from design requirements (Fig. 2).

When undertaking design tasks, students inevitably encounter conceptual challenges or spatial conflicts that expose specific knowledge gaps. At this critical juncture, rather than providing immediate solutions, instructors guide students to engage with authoritative sources, such as local TSP documents and design codes, and conduct field investigations. Crucially, this inquiry is not random; it follows the stratified objectives defined previously. Students synthesize abstract regulatory provisions with site-specific conditions and project objectives, translating them into concrete design strategies.

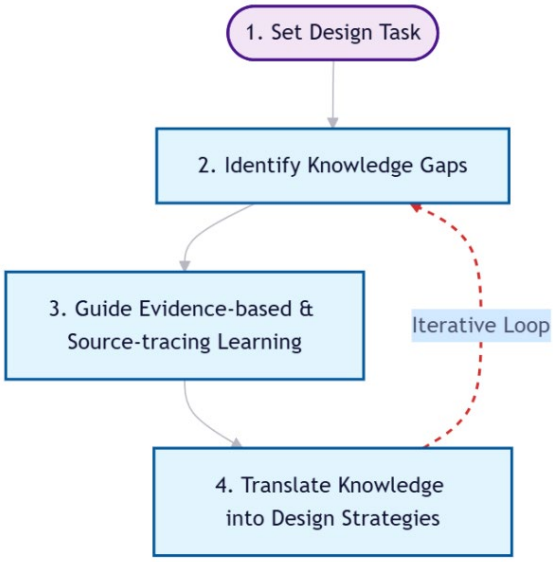

Fig. 2. Reverse Linkage Mechanism: Deriving Knowledge Learning from Design Requirements.

This process culminates in a complete cycle of knowledge translation. Through this iterative practice, planning evolves from external abstract regulations into an internalized driver generating design solutions and shaping spatial logic. Ultimately, by resolving real-world problems, students cultivate a closed-loop cognitive mode integrating planning theory with design praxis. This echoes C. Hua[7]'s assertion that planning education should shift from mere "knowledge transmission" to "cultivating planning thinking". Thus, the reverse-linkage mechanism ensures that every design decision is backed by theoretical understanding, effectively transforming planning from a passive constraint into an active generator of architectural form.

3 Practical Pathways for Integrating the Design-Anchored Philosophy

3.1 Restructuring Course Content: Prioritizing "Applicable" Knowledge

Aligned with professional trajectories, TSP knowledge is curated to prioritize applicability. After a framework overview, the curriculum is structured around three core modules driven by specific design tasks.

Identification of Top-Tier Constraints: Trains students to navigate the planning "One-Map" system, consult relevant higher-level plans and local regulations, and interpret mandatory provisions in regulatory detailed planning maps.

Deciphering Policy Intent: Analyzes the governance logic underpinning constraints. It clarifies the rationale behind requirements for elderly care facilities (aligning with the national strategy for active aging and equalizing basic public services) and restrictions on building façade width (optimizing the urban spatial environment and preserving urban character).

Design Response Strategies: Cultivates the ability to translate planning conditions into design inputs, such as balancing FAR, density, and green space through mixed-use programming and vertical greening.

Ultimately, by establishing a "Task – Problem – Knowledge" chain, this approach ensures instruction is directly applicable and learning is immediately actionable.

For instance, in an aging community regeneration project, students first identify specific physical and social problems (Identification). They then analyze national renewal policies to determine the permissible scale for adding public service facilities (Deciphering). Finally, they translate these constraints into spatial strategies—such as combining vertical circulation cores with social spaces or creating pocket parks—to enhance living quality while meeting regulations (Design Response).

3.2 Reengineering the Teaching Process

The reengineered process shifts from linear instruction to a spiral model, integrating design practice with theoretical supplementation to expose cognitive gaps and iteratively refine solutions through dual-faculty guidance.

Design-First Approach: Design tasks are front-loaded into the first week, requiring students to conceptualize solutions prior to acquiring comprehensive planning knowledge. This strategy intentionally surfaces misconceptions regarding planning constraints at the onset of the course.

Problem-Driven Instruction: Instructors synthesize recurring student inquiries—such as queries regarding road siting or parking within setback zones—to formulate the basis of targeted thematic lectures. This ensures a "just-in-time" pedagogical intervention that precisely addresses identified knowledge gaps.

Dual-Faculty Synergy: Urban-Rural Planning faculty guide the interpretation of higher-level plans and policy frameworks to ensure site compliance, while Architecture faculty focus on spatial design logic. Through co-led tutorials and final juries, this synergistic model integrates planning mandates directly into both land-use strategies and architectural solutions.

Consequently, traditional front-loaded theoretical lectures are significantly reduced. The saved instructional hours are reallocated to studio-based problem-solving sessions, where planning and architecture faculty provide real-time, cross-disciplinary feedback. This "just-in-time" pedagogical intervention ensures that students do not memorize isolated regulations, but rather learn to apply them dynamically during the design process.

3.3 Evaluation Mechanism

A comprehensive evaluation framework is established, underpinned by four key dimensions: Planning Comprehension (20%), Depth of Policy Translation (25%), Scheme Rationality (40%), and Design Innovation (15%), as illustrated in Fig. **3**. This mechanism prioritizes process-oriented translational competencies, empowering students to transform regulatory constraints into spatial opportunities.

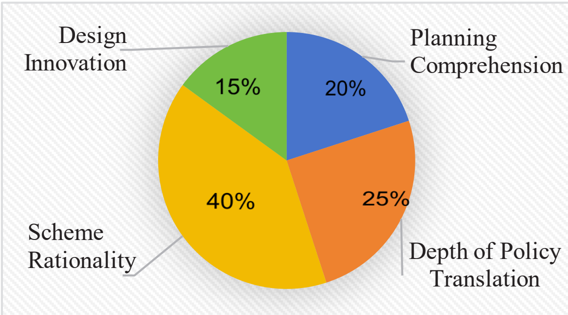

Fig. 3. Evaluation Mechanism Emphasizing Process-Oriented Translational Competencies.

Planning Comprehension assesses students' mastery of TSP systems and their ability to interpret statutory planning documents through regular in-class quizzes and pre-design site analysis reports. Depth of Policy Translation focuses on whether students can identify the underlying governance logic of index constraints instead of mechanically copying control indicators. As the core scoring item accounting for 40%, Scheme Rationality examines the consistency between design massing and FAR, green space ratio, public service matching and other mandatory planning limits. Design Innovation rewards creative spatial, low-carbon and community-oriented solutions on the premise of full compliance with planning requirements.

Different from traditional architectural design evaluation that overemphasizes visual rendering, this framework adopts a whole-process assessment covering stage sketches, mid-term policy interpretation reports and final design defense, shifting the evaluation focus from formal aesthetics to the capacity of coordinating macro planning governance and micro architectural creation.

4 Empirical Feedback on Pedagogical Implementation

To validate the feasibility and efficacy of the Design-Anchored pedagogical framework, the Architecture Program at Wuhan Polytechnic University initiated a pilot reform in the Spring Semester of 2025. Targeting third-year students enrolled in the "Principles and Design of Urban-Rural Planning" course, the pilot engaged 59 participants. The curriculum leveraged the renewal of the university's own Changqing Campus (approx. 21.5 hectares) as a live design project. With an anonymous survey response rate of 98%, the empirical feedback yielded the following insights.

4.1 Transformation in Cognitive Patterns and Behavioral Habits

As shown in Fig. 4, the reform brought remarkable changes to students' cognition and learning behaviors, alongside obvious improvements in their core design capabilities. Specifically, the proportion of students capable of proactively consulting local planning documents surged from 5.3% to 77.6%, while those understanding the application of design conditions rose from 13.8% to 95.2%. Notably, their design mindset evolved from the subjective inquiry of "How do I wish to design?" to a constraint-responsive optimization strategy centered on "How can optimal solutions be derived within specific regulatory parameters?". This cognitive shift is fully captured by the multi-dimensional evaluation framework proposed in Section 3.3.

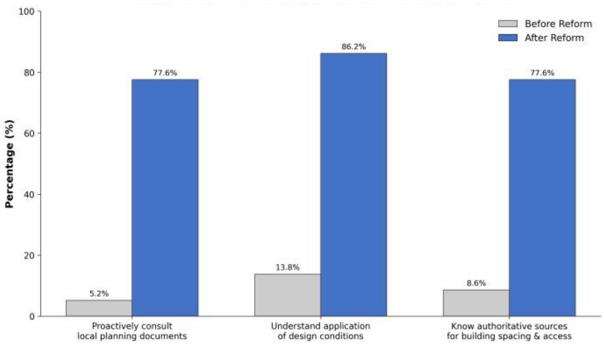

Fig. 4. Comparison of Students' Planning Application Ability Before and After Reform.

4.2 Outcome Presentation & Competency Leap

The presentation of outcomes reflects the internalization of planning logic. Students' final deliverables universally incorporated new modules, including Interpretation of Planning Basis, Indicator Comparison Matrices, and Explanation of Policy Intent Translation. These works demonstrated the ability to identify and respond to mandatory requirements, such as FAR, parking provisions, and green space ratios, while effectively translating concepts like functional mixed-use development and low-carbon practices into concrete spatial strategies. Collectively, these outcomes verify that the real campus renewal project effectively connects macro territorial governance requirements with micro architectural spatial design.

4.3 Student Perception & Pedagogical Acceptance

Complementing the objective performance data, the high survey response rate (98%) allowed for a robust analysis of student perception. The feedback indicates a strong acceptance of the "live project" approach, with students reporting that the tangible constraints of the Changqing Campus renewal provided a clearer sense of professional responsibility compared to hypothetical topics. This subjective validation confirms that the pedagogical reform not only improved technical skills but also enhanced learning engagement. Such positive feedback further validates the practicability of the design-anchored teaching paradigm.

5 Conclusion

The Design-Anchored paradigm positions design as the cognitive entry point and practical terminus, using specific tasks to retroactively activate Territorial Spatial Planning theory. It shifts pedagogy from "instruction before application" to "application-driven learning," moving focus from knowledge transmission to competency generation. This bridges the theory-practice gap, creating a replicable model for cultivating professionals with strategic vision and spatial agency.

Future work will deepen the synergy between territorial spatial planning and architectural curricula. By increasing the frequency of planning applications across diverse design scenarios, we aim to internalize planning requirements into students' design thinking, thereby accomplishing the final step of integrating macro-planning into micro-construction.

However, this study acknowledges a limitation: given the primary instructional focus on strengthening students' planning cognition, the approach currently facilitates unidirectional transmission from macro-governance to micro-design, while the mechanism for reverse optimization—where micro-spatial feedback informs macro-planning—remains underexplored. Future research will aim to establish this bidirectional feedback loop to further refine the Design-Anchored framework.

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