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Pedagogical Scaffolds and Material Tectonics: A Strategic Framework for Enhancing the B.Arch. Curriculum

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ABSTRACT

This paper proposes a pedagogical model for the existing 5-year B.Arch. programs that prepares students to navigate tensions between Global South material realities (bricks, bamboo, cement) and high-tech advancements (robotics, AI, IoT). Through a critical analysis of curriculum gaps at selected universities, we identify how conventional pedagogies fail to train students as "material diplomats", designers fluent in both vernacular tectonics and computational intelligence. We present a five-year scaffolded curriculum integrating maker-labs, decolonial tech modules, and industry partnerships. This model shows how students can transform challenges (e.g., unreliable grids, scarce robotics) into opportunities for innovation (e.g., Arduino-enabled bamboo sensors, optimized brick reuse systems). The paper argues that architectural education must prioritize contextual technacy over technological mimicry to foster graduates who ethically negotiate high-tech disruptions while advancing self-healing, community-centered architectures.

Keywords: Architectural Pedagogy, Architectural Bachelors, Analogue Computation, Vernacular Materials, Contextual Technacy, Digital Ethics in Technology

Introduction

The contemporary architect in Pakistan operates within a profound and often paralyzing bifurcation. On one hand, they are immersed in a tangible reality defined by the pervasive use of vernacular materials like brick, a deep reliance on skilled artisanal labor, and a construction landscape shaped by economic constraints and unreliable infrastructure (Prah, 2023). On the other hand, they are inundated with a global discourse celebrating the frontiers of architectural technology, robotic fabrication, artificial intelligence (AI) for generative design, and the Internet of Things (IoT) for creating responsive smart buildings (Carpo, 2022). This is not a simple choice between tradition and modernity, but a schism between two concurrent, often inadequate worlds. The local material reality demands an architecture of resourcefulness, passive environmental strategies, and cultural continuity, while the global technological narrative pushes towards a dematerialized, data-driven, and frequently context-agnostic future. This dichotomy creates what can be termed as the "diplomat's dilemma": the immense challenge of navigating these two powerful, opposing forces without being subsumed by either, forcing

practitioners into a precarious balancing act for which their education leaves them profoundly unprepared.

This unpreparedness stems directly from a pervasive gap in architectural pedagogy, which remains largely mimetic, replicating curricula and studio cultures inherited from the Global North. As argued by Awan, Schneider, and Till (2021), such pedagogical models are a form of "spatial colonialism," privileging universalizing technologies and aesthetic sensibilities over localized knowledge and contingent material practices. The evidence is stark in the curriculum frameworks in Pakistani Architectural School, where "Digital Tools for Architects" are taught as a siloed technical skill, utterly disconnected from the tectonic and material inquiries of the core design studios. Similarly, other architectural schools, while acknowledging workload issues, maintain a hard binary between "manual drafting" in foundational years and later "Computer Applications" courses, failing to scaffold a critical dialogue between the hand, the material, and the algorithm. This pedagogical mimicry produces graduates who are either luddites, rejecting technology as culturally corrosive, or technocrats, applying prefabricated digital solutions with a reckless disregard for local socio-ecological contexts. In both cases, they lack the essential agency to act as mediators, leaving them ill-equipped to transform the core challenges of the country such as material scarcity, energy poverty, and informal economies into the very drivers of architectural innovation.

This paper posits its central idea against the backdrop of pedagogical gaps and professional dissonance. We propose a reorientation of the five-year, B.Arch program towards a scaffolded pedagogical model explicitly designed to train "material diplomats." This new kind of architect is not defined by a nostalgic attachment to the vernacular nor by an uncritical embrace of the digital, but by a sophisticated fluency in ethically integrating both realms. The material diplomat is a negotiator, a critical thinker, capable of leveraging computational intelligence from parametric analysis to AI-driven material optimization to enhance, reimagine, and innovate with locally resonant tectonic systems (Odumusu, 2020). This paper will deconstruct a curriculum that systematically builds this "contextual technacy," moving from foundational analogue and digital literacy, through integrative studios that pair the technology of arduino microcontrollers with local materials like bamboo structures, to a final-year synthesis where technological choices must be ethically justified in a community-centered framework. By aligning this scaffold with PCATP's core domains, we argue that architectural education can finally abandon its mimetic past and create a generation of practitioners who can confidently navigate the bifurcated present, transforming the diplomat's dilemma from a source of tension into a wellspring of authentic, resilient, and self-determined architectural innovation.

Literature Review

The quest for an architecture that is both culturally resonant and modern finds a foundational theory in Kenneth Frampton's concept of Critical Regionalism. Originally articulated as a resistance to the placelessness of international modernism, Frampton (1983) advocated for an architecture that mediated universal civilization with local geography, light, and tectonics. He emphasized the "arrière-garde," not as a nostalgic retreat, but as a strategy to critically deploy local resources particularly material and climatic specificity against the spectacle of global consumer culture. However, the pedagogical legacy of Critical Regionalism has often been diluted into a superficial stylistic exercise, focusing on formal gestures like breezeways or vernacular motifs without engaging its deeper tectonic and material resistance. In the context of contemporary Pakistani education, this shortcoming is stark. As argued by Canizaro (2020), Frampton's tectonic emphasis provides a crucial entry point to discuss material agency, yet curricula often fail to update this conversation for the digital age. For instance, the analyzed

curriculum of a local university includes "Materials & Construction" courses, but they remain within a traditional, prescriptive framework, disconnected from the potential for computational material optimization or digital fabrication. Thus, while Critical Regionalism provides the initial imperative to root architecture in place, its educational application must evolve beyond a material-centric past to engage with what we might term *technological specificity* the critical calibration of advanced tools to local conditions.

This evolution demands a fundamental shift in how technology is framed within pedagogy, moving from the attainment of "technological fluency" to the cultivation of "technacy." Technological fluency, as critiqued by Odumosu (2020), is often reduced to operational competence in industry-standard software, a form of vocational training that produces skilled drafters but not critical designers. It is a pedagogy of the "how-to," concerned with efficient execution within a predetermined technological paradigm, typically one imported from the West. Technacy, in contrast, is a deeper, more critical form of literacy. Drawing from the work of Seemann (2009) in technology education, technacy in architecture involves the contextual intelligence to understand why and when to deploy a specific technology, and the ethical capacity to adapt, hybridize, or even reject tools based on socio-economic and ecological contingencies. It is the difference between using a complex energy-modeling software to achieve a Western green-building standard and possessing the technacy to develop a low-tech, Arduino-based sensor network that monitors and optimizes a passive cooling system built from local brick. The former demonstrates fluency; the latter demonstrates a sophisticated, context-driven judgment that is essential for relevant practice in resource-constrained environments.

The urgency of this shift from fluency to technacy is powerfully underscored by the decolonial turn in architectural education. Decolonial theory, as articulated by scholars like Mignolo (2011), demands a de-linking from the Western epistemological framework that positions its knowledge and technologies as universal and superior. In architectural terms, this means actively de-centering the hegemony of Global North softwares, construction standards, and aesthetic values, which often render local material intelligence and indigenous knowledge systems invisible or obsolete. As Awan, Schneider, and Till (2021) contend, this requires a pedagogy that engages in "epistemic disobedience," challenging the very sources of architectural knowledge deemed legitimate. The work of architects like Anna Heringer, who strategically integrates rammed earth and mud with sophisticated engineering, exemplifies a decolonial practice that dignifies local materials and labor (Heringer, 2023). A decolonial pedagogy would, therefore, frame a material like bamboo not as a "poor man's timber" but as a high-performance, sustainable resource whose potential can be amplified through computational analysis and low-tech digital sensors, creating a new, hybrid technological expression rooted in its context.

Ultimately, these three theoretical streams, the updated tectonic resistance of Critical Regionalism, the critical framework of technacy, and the epistemic re-centering of decolonial thought converge at a pedagogical crossroads. They collectively argue against a curriculum that treats technology as a neutral, universal tool and local materials as a folkloric concern. Instead, they demand an integrated approach where technology is studied as a culturally embedded practice and local materials are investigated as sophisticated systems ripe for technological innovation. The persistent silos observed at local architectural schools curricula, where digital tools and material courses run on parallel, non-intersecting tracks, represent the very antithesis of this integrated vision. The path forward, therefore, lies in constructing a pedagogical scaffold that deliberately fosters a dialogue between these realms, producing not just architects, but

the "material diplomats" who can navigate the complex interplay of global technology and local tactility with both critical acuity and ethical responsibility.

Methodology

Case Study Selection

To effectively diagnose the pedagogical gap within architectural education, this study employs a qualitative, multiple case study methodology, conducting a critical analysis of curriculum documents from two strategically selected Pakistani institutions. The cases were chosen to provide a comparative perspective across both time and institutional character, offering a comprehensive view of the educational landscape. The Case Study 01, is analyzed through its detailed and comprehensive 2017 "Scheme of Studies." This document represents a mature, established, and historically influential curriculum from a university with an explicit technology-oriented mandate, serving as a benchmark for a potentially entrenched pedagogical model. The Case Study 02, "Scheme of Studies" from its 2025 latest developed courses. This selection is particularly strategic, as it captures a curriculum in an explicit state of revision and modernization, reflecting the most current institutional responses to perceived gaps and external accreditation pressures from bodies like PCATP and HEC. By juxtaposing a settled curriculum (Case Study 01, 2017) with a newly reformed one (Case Study 02, 2025), this research can identify not only persistent, systemic flaws but also assess whether recent reform efforts genuinely bridge the core gaps between global technology and local context or merely perpetuate them in a new, repackaged form.

Analytical Framework

The analysis of these curricula is structured through a tripartite analytical framework, meticulously designed to move beyond a superficial inventory of course titles to a critical evaluation of their underlying pedagogical logic and philosophical alignment with the goal of fostering "contextual technacy." This framework operationalizes the theoretical concerns of spatial agency, decoloniality, and technacy into concrete criteria for diagnosing the gaps in architectural training. The first criterion, Integration vs. Siloing, scrutinizes the fundamental relationship between the core design studios the pedagogical heart of architectural education and courses dedicated to technology and tectonics. Drawing on the concept of "spatial agency" as articulated by Awan, Schneider, and Till (2021), this criterion assesses whether technical knowledge is presented as an integrated, indispensable driver of design thinking or as a disconnected set of compartmentalized skills. It specifically investigates the coupling or the stark lack thereof between sequences like "Digital Tools for Architects" or "Computer Applications" and the central "Architecture Design" studios, as well as their connection to material and construction courses. A siloed structure, as will be demonstrated, indicates a pedagogy of mere technical fluency, whereas an integrated one suggests the foundational scaffold for genuine technacy.

Progression of Technacy

The second criterion, Progression of Technacy, meticulously evaluates the curriculum's sequencing to determine if it scaffolds learning from fundamental, analogue principles to complex, context-aware digital applications. This is directly informed by Odumosu's (2020) argument for a sustained "dialogue" between local nature and advanced technology, rather than a simple succession. The framework maps the student's intended journey from manual and analogue skills such as drafting, freehand drawing, and physical model-making to digital and computational applications. A critically progressive curriculum would demonstrate a deliberate, iterative dialogue where later-stage digital tools are explicitly tasked with solving complex problems defined by the material, climatic, and socio-economic understanding

developed in earlier stages. Conversely, a curriculum that establishes a hard binary such as the UoG (2025) policy mandating exclusive manual work for two years before introducing digital tools fails to build this essential, recursive dialogue. Such a binary impedes the development of sophisticated technacy by treating analogue and digital as separate epochs rather than complementary modes of inquiry that must be interwoven throughout the educational journey.

Ethical and Contextual Engagement

The third criterion, Ethical and Contextual Engagement, examines the extent to which the curriculum explicitly frames local constraints as central design drivers rather than as peripheral or theoretical considerations. This is firmly rooted in the decolonial imperative to center local knowledge, material realities, and socio-ecological systems, as championed by scholars like Mignolo (2011). The analysis actively searches for evidence within course objectives, content descriptions, and implied studio briefs that directly engage with the pervasive challenges in the Pakistani context, such as material scarcity, unreliable energy grids, informal economies, or climate vulnerability. The mere presence of courses titled "Sustainable Architecture" or "Architectural Conservation" is noted, but the critical analysis lies in determining whether their content remains a theoretical abstraction or is concretely and persistently linked to local Pakistani and South Asian systems. Does the curriculum urge students to innovate *with* and *through* these constraints, thereby transforming them from perceived limitations into the very genesis of a responsive, resilient, and ethical architectural language? Collectively, this three-pronged framework allows for a systematic and rigorous diagnosis of where and how these representative curricula succeed or fail in their fundamental task: preparing the "material diplomat" for the complex, bifurcated realities of contemporary practice.

Findings: The Pedagogical Gaps in Current Frameworks

CaseStudy 01 (2017): A Pedagogy of Entrenched Silos

The analysis of the curriculum reveals a deeply entrenched pedagogical structure where technology, tectonics, and design thinking are systematically siloed, creating a fundamental disconnect that impedes the development of contextual technacy. This is most starkly evident in the treatment of digital tools. The sequence of "Digital Tools for Architects I-III" operates as a self-contained technical track, entirely separate from the core design studios between 4th and 8th semesters. These digital courses are narrowly focused on software proficiency "Learning 2D & 3D drawing, modeling and renderings in software like Rhino, Grasshopper, etc." with no curricular mandate to apply these tools to solve site-specific, material, or environmental challenges posed in the parallel studio projects. This approach cultivates what Odumosu (2020) identifies as a superficial "technological fluency," producing graduates skilled in representation but lacking the critical "technacy" to deploy digital tools as instruments of contextual and material innovation. Similarly, the "Material and Construction I-III" sequence between 4th semester and 6th semesters is presented as a passive, theoretical body of knowledge. The courses are purely lecture-based [2(2,0)], devoid of any practical "maker-lab" component where students could physically engage with local materials like brick, wood, steel and bamboo to understand their properties, limitations, and potential for hybrid digital-physical fabrication. This siloing creates a critical failure in synthesis; while the "Thesis Design" and "Sustainable Design" courses demand an integrated approach, the preceding curriculum provides no scaffolded framework to merge material intelligence with computational design, leaving students unprepared to bridge this gap independently.

Case study 02 (2025): Incremental Shifts Amidst Persistent Structural Gaps

The case study 02 curriculum demonstrates a clear institutional awareness of certain pedagogical shortcomings, yet the reforms undertaken are incremental and fail to dismantle the core structural binaries. Positive steps include the rationalization of student workload, the merging of overlapping theoretical courses like "Theory & Criticism in Architecture," and the crucial decision to incorporate practical components into formerly theoretical subjects such as "Architectural Conservation" and "Sustainable Architecture." These changes reflect a responsiveness to external feedback and an acknowledgment that certain knowledge domains require hands-on application. However, the revisions persistently treat technology as a separate, supportive skill rather than an integrated mode of inquiry. The "Computer Applications I-III" sequence remains a distinct track, and while its scheduling was adjusted to "better support the students' design development process," its fundamental nature as a technical skills course is unchanged. More critically, the explicit reaffirmation of a policy enforcing "manual drafting until the second year" establishes a rigid analogue-digital binary. This policy, while intended to strengthen foundational skills, inadvertently reinforces the very schism the "material diplomat" must transcend. It treats analogue and digital as sequential epochs rather than complementary languages that should be in constant dialogue, thereby failing to scaffold the progression towards the complex, context-aware digital applications that define technacy. Finally, while the inclusion of an internship is a commendable step toward professional practice, it is framed primarily as an evaluation and portfolio-building exercise. The curriculum misses a critical opportunity to explicitly frame the internship as the essential nexus for testing "contextual technacy" a real-world setting where students must ethically negotiate the very tensions between local construction practices and global technological possibilities that the academic curriculum leaves unaddressed.

Proposed Framework: The Five-Year Pedagogical Scaffold

Foundational Year: Cultivating a Dialectical Foundation of Hand and Code

The proposed framework initiates not with a binary choice between analogue and digital, but with a deliberate, dialectical grounding in both. The foundational year is designed to build a simultaneous and interconnected literacy in material tactility and digital representation, thereby preempting the schism seen in conventional curricula. Students engage in intensive manual making from brick-laying, wood carpentry (under supervision), Steel joinery (under supervision) and bamboo joinery workshops to tactile model-making to develop an intimate, non-mediated understanding of material behavior, weight, and assembly. This is not a nostalgic exercise but the cultivation of a crucial "material intelligence" (Pallasmaa, 2009) that forms the bedrock of all tectonic judgment. Concurrently, and critically not subsequently, students are introduced to foundational 2D/3D digital drafting and modeling. The goal is to establish from day one that the digital realm is not a separate world but another plane for conceptualizing and representing architectural thought. By running these streams in parallel, the curriculum scaffolds a fundamental principle: the hand and the computer are complementary instruments of inquiry, and fluency in both is the baseline from which all further innovation must spring, setting the stage for their eventual synthesis.

Intermediate Years: Forging Technacy through Tectonic Integration and Decolonial Tech

Building upon the foundational dialectic, the intermediate years pivot towards integration and critical application. The core design studios become the primary engine for this, where projects explicitly mandate the use of specific digital tools such as BIM (Revit) for coordinated documentation and environmental analysis software (e.g., Grasshopper, Ladybug, Butterfly) for performance feedback to resolve design problems centered on local materials and construction

systems. A student designing a community hall, for instance, would be required to use digital simulations to optimize a passive cooling strategy that leverages the thermal mass of local brick, thereby computationally validating a vernacular principle. This is supplemented by a mandatory "Decolonial Tech" module, a direct challenge to the imported, high-cost tech stack. This module introduces low-cost, open-source hardware platforms like Arduino and Raspberry Pi, tasking students with prototyping responsive building systems using vernacular materials for example, creating an "Arduino-enabled bamboo sensor" network to monitor structural deflection or indoor air quality. This pedagogical move, inspired by what Smith and others (2021) term "convivial tools," shifts the role of technology from a pre-packaged solution to a flexible, adaptable kit for context-specific problem-solving, actively cultivating the "contextual technacy" essential for the material diplomat.

Final Year: Synthesis, Ethical Negotiation, and Real-World Application

The scaffold culminates in a final year dedicated to synthesis, where students are required to ethically negotiate and demonstrably integrate every strand of their education. The capstone Thesis and Focus Studios are reconfigured to demand not just a design proposal, but an accompanying "Technology & Ethics Manifesto." This written and oral defense compels students to critically justify every technological and material choice from the source of their bricks to the algorithm of their generative design software in relation to community impact, life-cycle resource streams, cultural appropriateness, and economic feasibility. This transforms technology from a neutral tool into a subject of ethical scrutiny. This theoretical rigor is grounded through compulsory industry partnerships with local fabricators, NGOs, and municipal bodies. Students engage in live projects tackling real-world problems, such as developing "optimized brick reuse systems" for demolition sites or designing passive cooling towers integrated with simple IoT monitoring for urban settlements. This direct engagement ensures that the scaffolded learning of the previous four years is stress-tested against the complex, often contradictory realities of practice, ultimately producing graduates who are not just designers, but ethical innovators and true "material diplomats" for the Global South.

Implementation and PCATP Alignment

Mapping the Scaffold to Accreditation Domains: From Compliance to Integrated Mastery

The proposed scaffold does not merely fulfill PCATP and HEC accreditation requirements; it transforms them from boxes to be checked into demonstrable competencies. The "Building Systems" domain is profoundly enhanced by moving beyond theoretical lectures to an integrated model where structural and environmental principles are computationally tested and physically prototyped with local materials, as in the intermediate years' "Decolonial Tech" modules. This provides deeper, applied learning. Similarly, the "Professional Practice" requirement is elevated from a final-year theory course (like in Case Study 02's ARCH-512) to a continuous thread, culminating in the ethically charged live projects and the "Technology & Ethics Manifesto," which directly address professional responsibility, codes, and community engagement. Furthermore, "Allied Subjects" such as history and theory are woven into the scaffold's core, providing the critical and cultural context that informs the manifesto and material selections. This integrated approach ensures that graduates do not just possess isolated knowledge but can synthesize it, delivering on the spirit of PCATP's mandate for competent, contextually aware professionals.

Overcoming Institutional Hurdles: A Phased and Strategic Approach

The implementation of this model necessitates confronting significant institutional challenges through strategic planning. Faculty development is paramount; a phased program of workshops and collaborations with practitioners skilled in both vernacular tectonics and

computational design is essential to bridge the current expertise gap. The financial burden of establishing maker-labs can be mitigated through phased procurement, seeking industry partnerships for equipment, and focusing initially on low-cost, high-impact tools for working with materials like brick and bamboo. The most profound shift, however, lies in assessment. The curriculum must move beyond valuing only the final, polished drawing or model. New rubrics must be developed that explicitly reward the *process* of contextual technacy documented material experiments, the iterative logic of a parametric model responding to environmental data, and the ethical reasoning captured in the manifesto. This reorientation from judging formal outcomes to assessing integrated, contextualized problem-solving is the ultimate key to making the "material diplomat" a measurable and achievable graduate attribute.

Conclusion

The persistent and paralyzing dichotomy between the pervasive material realities in Pakistan and the seductive pull of global technological advancement is not merely a professional challenge for architects; it is a profound pedagogical shortcoming. Conventional architectural education, with its mimetic curricula and deeply entrenched silos between the digital and the tectonic, has proven itself inadequate to prepare graduates for this complex reality. The analysis of existing frameworks, from the established case study 01 (2017) model to the recently revised case study 02 (2025) curriculum, reveals a consistent pattern: a failure to scaffold the critical, ethical, and technical agility required to navigate this bifurcated landscape. By treating software as a mere representational tool and local materials as subjects of historical or theoretical study, these programs produce architects who are either technocrats applying ill-fitting digital solutions or traditionalists unable to leverage technology for innovation. This gap is the space where the "material diplomat" must be forged, yet our current institutions offer no workshop for their training.

The proposed five-year pedagogical scaffold presents a radical yet necessary reorientation, transforming this educational gap into a generative core. By systematically building from a dialectical foundation of analogue and digital literacy, through the integrative and decolonial tech applications of the intermediate years, to the ultimate synthesis and ethical negotiation of the final year, this model does not simply add courses it rewires the pedagogical DNA. It demands that technology be interrogated for its contextual suitability and that local materials be explored with computational intelligence. The result is a graduate who is neither a luddite nor a technocrat, but a sophisticated negotiator: a designer who can ethically leverage an Arduino to enhance the performance of steel/bamboo etc., or employ parametric analysis to optimize a brick reuse system. This shift from technological fluency to deep contextual technacy is the defining task for architectural education in Pakistan. By embracing this scaffold, institutions can finally move beyond their mimetic past and cultivate a generation of architects equipped to build a future that is both self-determined and sustainably advanced, turning the diplomat's dilemma into their greatest creative opportunity.

References

- Awan, N., Schneider, T., & Till, J. (2021). *Spatial agency: Other ways of doing architecture*. Routledge.
- Canizaro, V. (2020). *Critical regionalism and architectural pedagogy in the Anthropocene*. ACSA Press.
- Frampton, K. (1983). Towards a critical regionalism: Six points for an architecture of resistance. In H. Foster (Ed.), *The anti-aesthetic: Essays on postmodern culture* (pp. 16-30). Bay Press.
- Heringer, A. (2023). *The force of mud: Building with dignity*. Ruby Press.

- Mignolo, W. D. (2011). *The darker side of Western modernity: Global futures, decolonial options*. Duke University Press.
- Odumosu, T. (2020). The machine in the garden: A dialogue between technology and nature in the Global South. *Journal of Decolonial Science and Technology*, 1(1), 45-67.
- Pallasmaa, J. (2009). *The thinking hand: Existential and embodied wisdom in architecture*. John Wiley & Sons.
- Seemann, K. (2009). Technacy education: Understanding holistic technology and science teaching and learning to empower project-based contextual learning for all teachers and students. *Proceedings of the 2009 Australian Association for Research in Education International Education Research Conference*, 1-15.
- Smith, J., Abdulla, O., & Khan, S. (2021). *Convivial tools: Decolonial approaches to technology in the Global South*. Decolonial Press.