Historical Context and Contemporary Interventions

Integrating AI-assisted design processes into architectural education

Melek Demiröz[1],Sinem Çınar[2]
[1,2]Atılım University
[1,2]{melek.demiroz|sinem.cinar}@atilim.edu.tr

This study explores AI-assisted design methodologies in architectural education through a pedagogical experiment conducted during the 2024–2025 Fall Semester in a third-year architectural design studio. Titled "Contemporary Interventions in Historic Contexts," the workshop focused on using AI tools to engage with historical continuity and create contemporary architectural interventions. Set in Amasya, Türkiye—a city rich in architectural heritage—the studio examined the role of text-to-image and image-to-image AI tools in conceptual development, spatial representation, and iterative design. The research positions AI within architectural heritage discourse and design pedagogy, analyzing its role in facilitating design inquiry, engagement with historical context, and conceptual clarity. Findings show that, when integrated into iterative design, AI enhances students' ability to critically engage with historical contexts, explore novel spatial configurations, and develop innovative architectural responses. Rather than merely serving as a visualization tool, AI is framed as an active collaborator in the creative process, supporting architectural thinking while preserving human-centered design. The study uses a qualitative methodology, combining case study analysis and student work evaluation, including AI-generated images, sketches, models, and final proposals.

Keywords: *Historical Context, AI-assisted Design, Design Studio , Iterative Design Process, Architectural Pedagogy.*

INTRODUCTION

The integration of artificial intelligence (AI) into architectural education presents both transformative potential and pedagogical complexity, particularly in the realms of conceptual design and creative inquiry. As generative tools such as text-to-image and image-to-image models advance, they open new avenues for spatial representation and visual experimentation. Yet, their effective deployment in education requires a critical framework that promotes reflective engagement over passive automation. AI's value lies not in supplanting human creativity but in extending the scope of design exploration. When embedded within a thoughtful pedagogical strategy, these technologies can serve as active collaborators—amplifying analytical rigor and creative depth while preserving the centrality of the designer's intellectual agency. This study seeks to investigate the pedagogical potential of AI-assisted design methodologies in architectural education, with a specific focus on the design of contemporary interventions within historically significant environments. The research aims to critically examine the extent to which AI-driven tools can facilitate conceptual development, enhance contextual awareness, and support students in navigating the complex relationship between historical continuity and contemporary design expression. It explores AI's role as a mediator between abstract design thinking and contextual specificity, evaluating whether these technologies can bridge the gap between visual experimentation and site-responsive architectural solutions. Furthermore, the study interrogates the degree to which AI-generated outputs contribute to an iterative and reflective design process, emphasizing the importance of students' active engagement, critical analysis, and creative reinterpretation of AI-generated imagery.

By addressing these questions, the research contributes to broader academic discussions concerning the integration of emerging technologies in architectural education. It advocates for an approach in which AI is positioned not as a substitute for traditional design methodologies, but as an augmentative tool that enhances design thinking and critical reflection. Ultimately, the study emphasizes the need for a hybrid educational model, one that balances technological experimentation with theoretical and contextual rigor, ensuring that AI remains a facilitator of meaningful architectural inquiry.

The research is structured around a workshop entitled Contemporary Interventions in Historic Contexts, conducted within the third-year architectural design studio at the Department of Architecture during the 2024–2025 Fall Semester. The workshop functioned as an experimental platform to explore and test AI-driven design methodologies within historically significant urban settings. It also served as a preparatory phase for the subsequent studio project, The Institute of Water Policies and Research, situated along the Yeşilırmak River in Amasya—a city distinguished by its architectural heritage and dramatic topography. Within this framework, students engaged with AI tools to generate conceptual interventions and develop design strategies that respond sensitively to the historical and spatial context.

THEORETHICAL FRAMEWORK

To frame the theoretical foundation of this study, three thematic areas are considered: the role of studio-based education in addressing historical contexts, the integration of AI as a mediator between conceptual thinking and digital representation, and the potential of AI to support reflective design practices through iterative and critical engagement.

Architectural design studio education: contemporary interventions within historical contexts

The integration of architectural design within historical contexts constitutes a critical pedagogical strategy in architectural education. Understanding the historical context of a place is fundamental to architectural practice, as it encompasses the physical, cultural, and social dimensions that have accumulated and evolved over time. Accordingly, architectural education aims to cultivate students' ability to critically analyze and interpret historical environments, enabling them to develop thoughtful and responsible design strategies that respect and respond to these contexts.

The challenge of integrating new architectural interventions within historical settings has been widely discussed in architectural theory and practice. Scholars such as Colquhoun (1989) identify two contrasting perspectives on history: one that regards history as a repository of permanent values and another that views it as an evolving cultural process. Gaenssler and Möller (1978) emphasizes the dynamic and layered nature of urban environments, where each new intervention contributes to an ongoing process of urban evolution (Loew, 2003). Within this discourse, the tension between preservation and innovation is a central concern. Gaenssler and Möller (1978) advocates for integration rather than imitation or rejection, arguing that new architecture should contribute meaningfully to historical contexts without undermining their integrity. Building upon these discussions, Demiri (2013) proposes three distinct approaches to contemporary interventions in historical settings: contrasting, referential, and differential. He emphasizes that successful design interventions establish a meaningful dialogue with historical contexts through interpretation, rather than replication or isolation. This theoretical framework suggests that a nuanced, historically informed yet creatively adaptive approach is essential when designing within historically significant environments.

In the context of design studio education, these theoretical perspectives inform the pedagogical structure and thematic focus of studio activities. Studio discussions are organized around key themes that aim to deepen students' understanding of architectural responsibility and critical engagement with historical contexts. One central theme is the negotiation between continuity and transformation, prompting students to critically examine how architectural interventions can preserve historical identity while accommodating change. The studio encourages students to critically explore contextually grounded design strategies that move beyond imitation to enrich and extend the historical narrative.

Bridging concept and computation: the role of AI in architectural design education

The increasing integration of artificial intelligence (AI) technologies—particularly text-to-image and image-to-image generation tools—has introduced new opportunities and challenges for architectural design education. These tools enable rapid visualization of spatial ideas and formal alternatives, offering students new ways to externalize and communicate their design intentions. However, the pedagogical value of AI-assisted design depends not only on the technical capacity of these tools but also on how critically and meaningfully they are embedded within the design process. The theoretical basis for incorporating AI into design education draws upon broader discussions on visual cognition, creativity, and computational design methodologies. Smith, Finke, and Ward (1992) emphasize the role of mental imagery in creative ideation, arguing that the ability to form, manipulate, and refine cognitive images is central to generating novel design solutions. In architectural design, this cognitive process involves both internal visualization and external representation through various media. Digital visualization technologies can support this process by providing immediate visual feedback, enabling iterative exploration and critical evaluation. Agkathidis et al. (2024) further highlight how computational tools facilitate the translation of abstract concepts into concrete spatial representations, bridging the gap between conceptual thinking and material expression. Leach (2022) further suggests that AI-based image generation can disrupt conventional design paradigms and stimulate imaginative reflection by offering unexpected visual outcomes. Within this framework, AI-driven applications function as extensions of cognitive design processes, supporting the emergence of unforeseen formal and spatial possibilities. Similarly, Bolojan (2022) emphasizes the creative potential of AI when critically engaged, suggesting that these technologies can encourage new modes of architectural expression and experimentation.

AI as a catalyst for reflective practice in architectural design education

Beyond its computational capabilities, AI can act as a catalyst for reflective practice in architectural design education. Chaillou (2019) asserts that the computer, initially conceived as a tool for manual representation, has evolved into a medium through which architectural knowledge can be structured and design alternatives generated. Building upon this argument, this study conceptualizes AI not as an autonomous designer but as an instrument that provokes students to reimagine spatial contexts and critically refine their design methodologies. This perspective aligns with Schön's (1983) concept of "reflective practice," which emphasizes an iterative process of exploration, critique, and adaptation. Within this framework, AI becomes a tool for provoking new ways of thinking, prompting students to evaluate, reinterpret, and develop their conceptual frameworks through continuous feedback and critical engagement. Likewise, Hermund et al. (2024) and Prix et al. (2022) argue that AI should not be seen as a substitute for human creativity but as a means to expand its possibilities. Kudless (2024) reinforces this view by likening AI-generated imagery to the role of artistic sketches in early design ideation. Like sketches, AI outputs are valued for their speed, iterative potential, and capacity to evoke atmosphere and possibility, rather than their precision or completeness. However, Kudless (2024) cautions against the risk of overreliance on AI-generated content, underscoring the need to balance coherence and imaginative unpredictability to avoid producing generic or uncommunicative results.

Through the reflective process, students progressively develop AI literacy—not as passive users, but as active agents who strategically engage with computational tools. Experimentation and iteration enable them to refine their prompts, moving from unstructured inputs to intentional, well-defined queries. This stimulates a deeper understanding of AI as a medium that can expand, rather than dictate, the design process, while reaffirming the designer's critical and creative agency.

SCOPE AND PROCESS OF THE PROJECT

This study examines the processes and outcomes of a workshop conducted as a preparatory exercise for the main design project of the 2024-2025 Fall Semester in the third-year architectural studio. The main project, which involves the design of a "Water Policies and Research Institute" along the banks of the Yeşilırmak River in Amasya, is situated within a historically rich and topographically dramatic setting. The AI workshop, titled "Contemporary Interventions in Historical Contexts," was designed both to explore the pedagogical dimensions of designing in a historical environment and to investigate the potential of AI as an integrated tool in architectural design processes. The primary objective was to enhance students' awareness of Amasya's historical and geographical context while simultaneously exploring how a contemporary architectural language could engage with contextual elements such as dramatic topography and waterfront conditions.

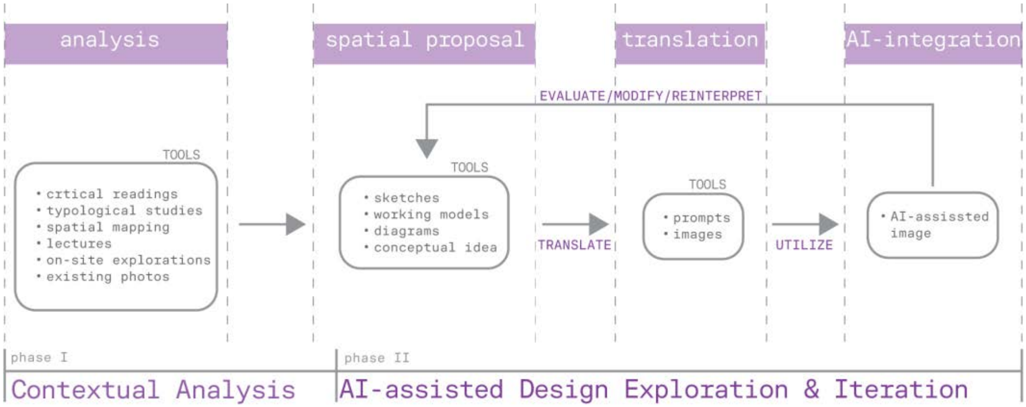
Workshop structure

The design process is structured around feedback loops that enable iterative refinement and ease the solving of errors or inaccuracies encountered throughout the workflow. This feedback-driven approach ensures that design outputs are continuously improved. In this context, students utilize a range of digital tools and techniques, including image synthesis platforms such as Leonardo AI, Midjourney, and DALL·E; 3D modeling software like SketchUp; and image editing programs such as Photoshop, enhanced with its recently integrated AI capabilities.

The workshop employed a two-phase pedagogical framework that combined contextual analysis with AI-assisted design exploration and iterative refinement, enhancing students' ability to engage critically with Amasya's historical fabric while utilizing AI tools to within their design processes (see Figure 1).

In the first phase, contextual analysis, students conducted an in-depth study of Amasya's architectural and urban heritage. This involved typological studies and spatial mapping of key structures, including the Yalıboyu Houses and monumental buildings from the Seljuk and Ottoman periods—such as külliyes, baths, madrasas, mosques, and the iconic rock-cut tombs. Supported by lectures from architectural historians, critical readings, and on-site exploration, this phase provided students with an experiential understanding of the city's spatial and material complexities.

Figure 1
Design Process



Building upon this foundation, the second phase, AI-assisted design exploration and iterative refinement, facilitated an ongoing dialogue between digital and traditional methods. Students first identified site-specific challenges and potentials, formulating spatial proposals through a scenario-based approach. They then utilized text-to-image and image-to-image AI tools to generate visualizations, incorporating hand-drawn sketches, contextual photographs, and carefully crafted prompts. Rather than accepting AI outputs as definitive solutions, students critically analyzed, modified, and reinterpreted these visuals—translating them into manual sketches, physical models, and digital renderings. This continuous cycle of evaluation and adaptation fostered a hybrid methodology, integrating computational tools with conventional architectural techniques to develop spatially coherent, contextually responsive, and architecturally viable design solutions.

Design themes and conceptual challenges

The workshop provided a platform for critically examining several key themes, shaping both the pedagogical framework and the design discourse.

Reinterpretation of Historical Context. A primary concern of the workshop was the relationship between contemporary architectural interventions and Amasya's historic fabric, particularly in the context of the Yalıboyu Houses. Rather than resorting to superficial stylistic imitation, students were encouraged to engage in a critical and analytical examination of the spatial, morphological, and material characteristics of these structures. The objective was to extract underlying architectural principles—such as proportional relationships, modular organization, and spatial sequencing—and employ them as generative elements in contemporary design propositions (see Figure 2).

Topographical Adaptation. Amasya's dramatic topography, characterized by steep inclines, elevated rock formations, and layered urban settlements, posed another critical design challenge. The workshop examined how architectural interventions could respond to these extreme topographical conditions, emphasizing adaptive and site-sensitive design strategies. Students explored sectional complexities, terracing techniques, and vertical transitions, seeking ways to establish a harmonious dialogue between built forms and the natural landscape (see Figure 3).

Figure 2
Student work 1

Figure 3
Student work 2

Figure 4
Student work 3

Through this process, they developed architectural solutions that not only acknowledged but actively engaged with the city's unique geographical constraints, reinforcing the notion that topography is not merely a backdrop but an active agent in spatial design.

Reimagining the Riverfront. The relationship between the built environment and the Yeşilırmak River emerged as another central theme, given the river's historical significance as a structural and social spine of the city. The workshop explored how contemporary interventions could revitalize the riverfront, supporting public engagement, ecological sensitivity, and urban connectivity. Students investigated a range of architectural and landscape strategies, from adaptive reuse of existing waterfront structures to the creation of new public spaces that blurred the boundary between land and water (see Figure 4).

While AI-assisted tools facilitated rapid spatial prototyping and morphological experimentation, students were required to create alternatives and critically evaluate these outputs, ensuring that their AI generated final proposals were not only visually compelling but also aligned with broader urban, environmental, and social considerations.

KEY FINDINGS AND DISCUSSION

The workshop presented a hybrid pedagogical model that reinforces the enduring significance of critical thinking, spatial reasoning, and material intelligence within architectural education.

One of the central insights of the workshop was the recognition of the iterative nature of the AI-assisted design process. The findings suggest that AI can function as a powerful catalyst for conceptual inspiration, a tool for testing ideas, and a means of visualizing unpredictable spatial relationships. However, this potential is only realized when AI is integrated into a rigorous, reflective design methodology, which allows it to contribute meaningfully to the development of creative design solutions with contextual considerations. A particularly notable insight was the recognition that AI-generated visuals often default to generic and highly aestheticized representations, which, while visually compelling, do not always offer contextually relevant or site-specific design solutions. In response to this tendency, students were encouraged to abstract AI-generated visuals into fundamental sketches, extracting and refining underlying spatial principles through iterative processes. By providing the AI with site-specific images or data, students aimed to establish a stronger connection with the contextual environment. Those who engaged in blending site-related photographs into their AI prompts demonstrated greater success compared to those who relied solely on textual input. This approach illuminated the importance of maintaining agency over AI outputs, emphasizing the need for intentional, critical design input rather than passively accepting AI-generated imagery as final solutions. This engagement with AI underscored the idea that design thinking remains an inherently human-centered process, where technology functions as an aid, not a determinant. The effectiveness of AI was particularly evident in the generation of massing studies and spatial sequencing. By producing multiple iterations of these elements, students were able to compare and contrast various spatial configurations, ultimately refining their design decisions. This iterative approach not only enhanced students' design decision-making capabilities but also deepened their understanding of spatial relationships.

A recurring challenge faced by the students was the risk of over-reliance on AI-generated visuals, which, while expedient, could lead to superficial or formulaic designs. In order to exercise control over artificial intelligence or to avert its uncontrolled proliferation, the students initially endeavored to articulate their ideas in an abstract manner through sketching or digital drawing.

Another critical observation involved the necessity of process-oriented design thinking when incorporating AI into architectural workflows. In the early stages, students often produced visually striking images that, while compelling, lacked the substantive architectural reasoning necessary for a comprehensive design solution. As the workshop progressed, students learned to view AI as a tool for exploration rather than a shortcut to predetermined results, allowing them to engage more critically with the design process and ensure that their design decisions were grounded in architectural principles.

CONCLUSION AND FUTURE DIRECTIONS

This study positions artificial intelligence (AI) as a complementary tool in architectural design education, demonstrating its ability to enhance design processes without overshadowing the fundamental principles of conceptual depth and critical thinking. By integrating AI into the pedagogical framework, the workshop emphasized the importance of encouraging AI literacy among students. This literacy ensures that students not only develop the technical skills to utilize AI effectively but also engage with the tool critically, allowing for a deeper understanding of its potential and limitations within the design process.

The workshop findings affirm the value of AI as a complementary tool, one that can enrich the design process when integrated thoughtfully into historically grounded, contextually sensitive, and iterative design practices.

Ultimately, the pedagogical aim is not merely to integrate AI into architectural education, but to embed it within a reflective, iterative, and human-centered design practice. While AI technologies continue to evolve, the core principles of architectural thinking—conceptual depth, spatial reasoning, and critical engagement—remain essential. The challenge lies in ensuring that the use of AI supports reflective practice, creative agency, and intellectual rigor within the design process.

Future research may further advance the present study by investigating the potential of AI-assisted design not only as a means of supporting design inquiry, engagement with historical context, and conceptual clarification, but also as a mechanism for uncovering the underlying motivations that inform design decisions. A comprehensive understanding of the rationale behind design—grasping the 'why' in addition to the 'how'—is essential, particularly within creative and educational contexts. To this end, incorporating image-to-text applications alongside text-to-image and image-to-image approaches offers a promising avenue. Such tools, capable of extracting narratives, intentions, and interpretive meanings from visual content, may contribute to more reflective and insight-driven design practices.

Moreover, to develop an effective Intelligent Assistant (IA) in architectural design, future iterations must incorporate components that support a fluid transition between the preliminary and detailed phases of the design process. Without this continuity, preliminary ideas risk being lost as projects advance.

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