

AI in Architectural Education: Rethinking Studio Culture

Mimarlık Eğitiminde YZ: Stüdyo Kültürünü Yeniden Düşünmek

Derya KARADAĞ¹



¹ Interior Architecture and Environmental
Design, Faculty of Art, Design and Architecture,
FMV Işık University, İstanbul, Türkiye



ABSTRACT

This article examines the pedagogical transformations emerging in architectural education through a conceptual and critical perspective focused on human-AI co-creativity. Co-creativity specifically refers to collaborations between human designers and artificial intelligence, in contrast to broader notions of collaborative creativity. The paper argues that AI functions not merely as a technical instrument, but as a co-creative partner that reshapes studio culture, authorship, and creative work. Drawing on selected studio-based cases, the study explores how AI-supported workflows influence ideation, representation, critique culture, prompt literacy, and ethical reasoning. Thematically, it engages with concepts such as cognitive augmentation and conceptual ambiguity to demonstrate how design pedagogy is evolving in response to intelligent systems. Rather than viewing AI as a generative tool alone, the article positions it as an epistemic and ethical agent that prompts a rethinking of studio environments as cultural and pedagogical spaces. Methodologically, the study adopts a case-based approach, analyzing selected 16 design studios in which AI was integrated into early-stage ideation, feedback sessions, and conceptual development. These cases extent strategies from prompt-driven speculation to hybrid critique practices, revealing a dynamic landscape of experimentation and adaptation. The findings suggest that AI can foster deeper conceptual inquiry, student reflection, and new modalities of authorship and collaboration. Eventually, the study underscores the need for reflexive pedagogical frameworks that integrate AI meaningfully enhancing, rather than displacing, human creativity.

Keywords: Architecture, Architectural Education, Artificial Intelligence, Human-AI Co-Creativity, Design Studio.

ÖZ

Bu makale, mimarlık eğitiminde ortaya çıkan pedagojik dönüşümleri insan-yapay zekâ eş yaratıcılığına odaklanan kavramsal ve eleştirel bir perspektifle ele almaktadır. Eş yaratıcılık özellikle insan tasarımcılar ile yapay zekâ sistemleri arasındaki iş birliğini ifade etmekte; daha geniş kapsamlı iş birliğine dayalı yaratıcılık anlayışlarından ayrılmaktadır. Makalede, yapay zekânın yalnızca teknik bir araç olarak değil, aynı zamanda stüdyo kültürünü, tasarım sahipliğini ve yaratıcı özneliği dönüştüren bir eş yaratıcı ortak olarak işlev gördüğü savunulmaktadır. Seçilen stüdyo temelli örnekler üzerinden, yapay zekâ destekli iş akışlarının fikir geliştirme, temsil, eleştiri kültürü, istem okuryazarlığı ve etik düşünme üzerindeki etkileri incelenmektedir. Bilişsel artırma ve kavramsal belirsizlik gibi temalar çerçevesinde, yapay zekâyı dayalı sistemlerin mimarlık pedagojisinde nasıl bir dönüşüm başlattığı tartışılmaktadır. Makale, yapay zekâyı yalnızca üretken bir araç olarak değil; kültürel ve pedagojik bir alan olarak stüdyo ortamını yeniden düşünmeye sevk eden epistemik ve etik bir özne olarak konumlandırmaktadır. Çalışma, yapay zekâ araçlarının fikir geliştirme, geri bildirim ve kavramsal gelişim süreçlerine entegre edildiği, seçilen 16 tasarım stüdyosunu vaka temelli bir yaklaşımla analiz etmektedir. Bu stüdyolar, isteme dayalı spekülasyon üretimden hibrit eleştiri biçimlerine uzanan stratejileri ortaya koyarak deneysel ve uyarlayıcı bir pedagojik manzara çizmektedir. Bulgular, yapay zekânın kavramsal sorgulamayı derinleştirebileceğini, öğrenci tepkisini teşvik edebileceğini ve tasarım üretiminde yeni ortaklık ve paylaşım biçimlerini destekleyebileceğini göstermektedir. Sonuç olarak, insan yaratıcılığını gölgelemeyen; aksine onu derinleştiren eleştirel ve bütüncül pedagojik çerçevelere duyulan ihtiyaç vurgulanmaktadır.

Anahtar Kelimeler: Mimarlık, Mimarlık Eğitimi, Yapay Zekâ, İnsan-Yapay Zekâ Eş Yaratıcılığı, Tasarım Stüdyosu

Received / Geliş Tarihi 24.07.2025

Revision Requested /
Revizyon Talebi 21.08.2025

Last Revision / Son
Revizyon 04.09.2025

Accepted / Kabul Tarihi 05.09.2025

Publication Date / Yayın
Tarihi 16.09.2025

Corresponding author / Sorumlu Yazar:
Derya KARADAĞ

E-mail: derya.karadag@isikun.edu.tr

Cite this article: Karadağ, D. (2025). AI in architectural education: Rethinking studio culture. *PLANARCH - Design and Planning Research*, 9(2), 243-253. DOI: 10.54864/planarch.1749891



Content of this journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Introduction

The integration of artificial intelligence (AI) into architectural education has become a defining issue of contemporary design pedagogy. As AI-generated images and text outputs circulate across design platforms, studios, and competitions, architectural educators face a fundamental question: What does creativity mean when assisted by algorithmic tools? This question is not only technological but also epistemic and pedagogical, it asks how learning, authorship, and design reasoning are reshaped in the presence of intelligent systems.

The goal of this paper is to map how architectural pedagogy is evolving through AI-supported workflows and what this transformation demands from students, instructors, and institutions. Rather than portraying AI as a risk to creative autonomy, this study approaches it as a conceptual partner, one that can provoke epistemic inquiry and expand reflective design pedagogy. In recent years, as AI tools have become increasingly embedded in creative practice, discussions of design authorship, originality, and critical judgement have taken on new necessity within architectural education. When used critically, AI has a potential to improve creative risk-taking, encourage iteration, and support students in navigating ambiguity. AI becomes not a shortcut to visual production, but a means of surfacing tensions around judgment, originality, and aesthetic agency.

Methodologically, the study draws from selected 16 design studios that integrate AI tools such as Midjourney, DALL·E, and ChatGPT in architectural education. Rather than focusing on technical innovation, the aim is to critically examine how AI transforms ideation and conceptual development, prompt literacy, critique culture and studio dynamics, and authorship, ethics, and reflexivity.

This paper builds on emerging research that situates AI within a broader rethinking of creativity, cognition, and authorship in architectural education. It engages with theories of human-AI co-creativity, distributed authorship as the shared generation of ideas between human and machine, and extended cognition. These conceptual frameworks support an understanding of AI not simply as a tool, but as a facilitator that shapes not only design outcomes but the cognitive and ethical frameworks in which design occurs.

Literature Review: Conceptual Foundations of Human-AI Co-Creativity

Human-AI co-creativity represents a paradigm shift in the understanding and practice of creativity within design disciplines. As artificial intelligence increasingly contributes to design processes, traditional conceptions of creativity, long centred on human cognition and intuition, are being reframed through more collaborative, hybrid models (Chandrasekera et al., 2024). This shift necessitates a re-examination of the epistemic, cognitive, and evaluative structures that support creative production in design education. Concepts outlined in the literature establish the framework for the case-based analysis that follows.

Creativity in design is generally defined as the production of outcomes that are both original and valuable (Sarkar & Chakrabarti, 2011). Within architecture, this notion expands to include spatial, cultural, and ethical dimensions. Han et al. (2019) propose a threefold model of design creativity, originality, usefulness, and surprise, emphasizing surprise as an element of unexpectedness that evokes aesthetic and cognitive disruption.

Their findings challenge established assessment standards by showing that originality and surprise correlate strongly, while usefulness has little predictive power.

Margaret Boden's (1998, 2004) distinction between psychological and historical creativity offers a useful perspective for evaluating both human and AI-generated outputs. While psychological creativity involves ideas that are new to the individual, historical creativity refers to innovations recognized as original at a cultural context or disciplinary scale. Generative systems like Midjourney and Stable Diffusion often exhibit psychological creativity by generating unfamiliar combinations, yet their lack of contextual awareness and dependence on training data, restrict their capacity for historical creativity. As a result, AI outputs only gain meaning when interpreted and situated within broader design discourse. While Han et al.'s (2019) threefold model aligns with psychological theories, such as Boden's (1998) view of creativity as a synthesis of divergent thinking, associative reasoning, and contextual judgement, its application in design contexts requires further reflection. In architecture, the value of creative outcomes is not determined by formal or functional competence alone but emerges through contextual interpretation and cultural meaning.

Design theorists emphasize that creativity is inseparable from iterative framing and abductive reasoning. Cross (2011) describes design thinking as visual, iterative, and ambiguity-embracing; Dorst and Cross (2001) highlight co-evolution, where problem and solution evolve together. In studio settings, this co-evolution demands that students learn to reframe intentions and navigate ambiguity—capacities that AI alone cannot achieve. Current systems remain largely reactive, optimizing within predefined goals (Dorst, 2011) but lacking the interpretive flexibility central to design creativity.

Design theorists emphasize that creativity in design is deeply tied to iterative problem framing and abductive reasoning. Cross (2011) describes design thinking as a visual, iterative, and ambiguity-embracing mode of inquiry, one that thrives in contexts of uncertainty and ill-structured problems. Dorst and Cross's (2001) notion of co-evolution further elaborates this idea: in creative design, the problem and solution evolve simultaneously through ongoing reinterpretation. In studio settings, this co-evolution demands that students learn to reframe intentions and navigate ambiguity—capacities that AI alone cannot achieve. Current generative AI remain largely reactive, optimizing within predefined goals (Dorst, 2011) but lacking the interpretive flexibility central to design creativity.

Nonetheless, AI can serve as a cognitive amplifier. Wilson and Daugherty (2018) describe this synergy as "collaborative intelligence" where human judgement and machine computation iteratively build on one another. Shneiderman's (2020) human-centred AI model calls for high human control alongside advanced automation, while Clark and Chalmers's (1998) theory of the "extended mind" provides a theoretical foundation for understanding this relationship. By delegating cognitive functions, such as pattern recognition, data retrieval, or parametric iteration, designers can redirect effort toward higher order creative reasoning. When integrated into creative workflows, AI tools can become cognitive extensions, active components in a distributed system through which ideation and evaluation occur. From this perspective, creativity is not the only product of an isolated human mind, but the emergent property of a hybrid cognition, composed of human intentions, algorithmic capabilities, and contextual mediation.

Building on this, Gaggioli et al. (2025) propose the Extended Creativity Framework, which outlines human-AI creative relations across a spectrum: from “Support”, where AI is treated as a passive tool; to “Synergy”, where AI actively assists human design processes; and finally, to “Symbiosis”, where both act as co-authors in shaping outcomes. This model underscores that co-creativity lies less in technical ability than in interactional structure, the quality of engagement between human and machine.

Despite these affordances, AI systems still exhibit limitations. The pedagogical relevance of these distinctions becomes particularly apparent when considering how students must navigate ambiguity, frame intent, and make critical decisions within AI-supported workflows. Co-creativity thus demands that learners cultivate literacies not only in tools and prompts, but in reflexive judgement, conceptual framing, and ethical interpretation. Sarkar and Chakrabarti’s (2011) model highlight that true creativity involves both originality and relevance, a standard that many generative AI tools struggle to meet. While these systems excel at producing original visual combinations, they often lack the contextual awareness necessary to ensure relevance, coherence, or value within the specific cultural and spatial demands of architectural design. As D’Souza and Dastmalchi (2024) argue, tools like Midjourney may produce exciting images, but they often lack conceptual depth, authorship, and functional coherence. Their outputs require human framing, evaluation, and transformation to acquire architectural meaning.

Eventually, this highlights a deeper distinction: human creativity is not simply about generation, but about selectivity and judgement. Cross (2011) emphasizes the metacognitive aspects of design thinking, reflection, iteration, and reframing, that current AI systems cannot perform. These systems lack intentionality, ethical reasoning, and the capacity to situate their outputs within interpretive or socio-cultural frameworks. While they may serve as provocateurs or catalysts, the act of assigning meaning, contextualizing relevance, and making evaluative decisions remains a human responsibility.

Table 1 synthesizes five theoretical constructs that frame human-AI co-creativity and situates them within pedagogical contexts. Distributed authorship emphasizes creativity as emerging through the co-evolution of problems and solutions, redefining authorship as a shared agency across students, instructors, and AI systems (Cross, 2011; Dorst & Cross, 2001). Collaborative intelligence highlights the complementary strengths of humans and machines, encouraging dialogic, feedback-rich workflows in design studios (Wilson & Daugherty, 2018). Extended cognition positions AI tools as integral extensions of cognitive processes, forming part of a design literacy of “thinking-with-tools” (Clark & Chalmers, 1998). Co-creativity underscores creativity as arising from interaction, ranging from supportive tool use to full symbiosis, foregrounding the importance of iterative framing and reflection (Boden, 1998, 2004; Gaggioli et al., 2025). Finally, productive indefiniteness treats ambiguity, surprise, and reframing as productive drivers of innovation, legitimizing uncertainty as a pedagogical resource (Cross, 2011; Han et al., 2019).

The “Design Studio Implications” then translates these constructs into the language of pedagogy, reflecting the interpretive attempt made in this study. Authorship is reframed as shared agency within studio practice; collaborative intelligence is expressed through dialogic, feedback-rich workflows; extended cognition becomes a literacy of thinking-with-tools; co-creativity is recast as a process of iterative framing and reflection; and productive indefiniteness is revalued as pedagogical openness to ambiguity. Finally, the “Connection to Case Analysis” shows how these constructs underpin the four analytical categories used in examining the case studies, Ideation and Conceptual Development (ID), Prompt Literacy (PL), Critique Culture and Studio Dynamics (CSD), and Authorship, Ethics, and Reflexivity (AE). By linking theoretical sources, pedagogical interpretations, and analytical dimensions, Table 1 demonstrates how abstract discussions in design research can be mobilized as actionable frameworks for architectural education.

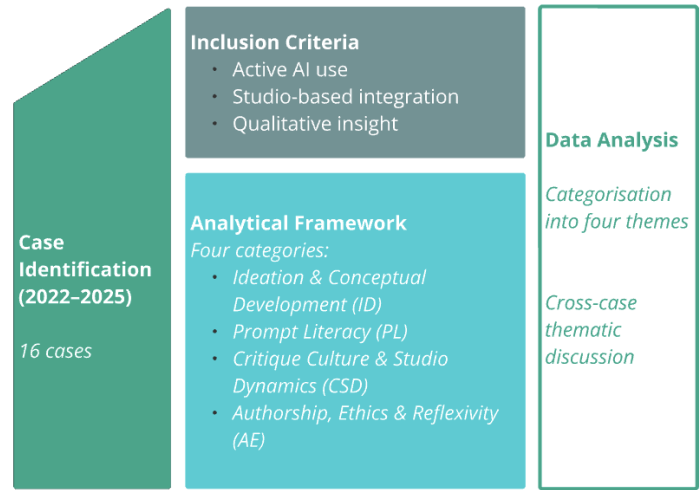
Table 1.
Theoretical Constructs of Human-AI Co-Creativity, Their Pedagogical Implications, and Connection to Case Analysis

Key Concept	Definition	Design Studio Implications	Connection to Case Analysis
Distributed Authorship (Cross, 2011; Dorst & Cross, 2001).	Creativity emerges through co-evolution of problems and solutions, shaped by shared processes across agents and representations.	Redefines authorship as shared agency between students, instructors, and AI systems.	<i>Authorship, Ethics, and Reflexivity (AE)</i>
Collaborative Intelligence (Wilson & Daugherty, 2018).	Human and AI iteratively build on one another’s strengths in a complementary partnership.	Encourages dialogic, feedback-rich workflows, supporting peer-AI-instructor interaction.	<i>Ideation and Conceptual Development (ID) + Critique Culture and Studio Dynamics (CSD)</i>
Extended Cognition (Clark & Chalmers, 1998).	Cognitive processes extend into external tools that support memory, reasoning, and ideation.	Frames AI tools as part of a design literacy of “thinking-with-tools.”	<i>Prompt Literacy (PL)</i>
Co-Creativity (Boden, 1998, 2004; Gaggioli et al., 2025).	Creativity arises through interaction, ranging from supportive tool use to full symbiosis, rather than isolated authorship.	Highlights the need for iterative framing and reflection, cultivating interpretive skills.	<i>Ideation and Conceptual Development (ID) + Critique Culture and Studio Dynamics (CSD)</i>
Productive Indefiniteness (Han et al., 2019; Cross, 2011).	Ambiguity, surprise, and reframing drive innovation and interrupt recognised patterns.	Validates ambiguity as a pedagogical resource, fostering exploration and open-ended design.	<i>Ideation and Conceptual Development (ID) + Critique Culture and Studio Dynamics (CSD)</i>

Material and Methods

This study adopts a qualitative, case-based approach to investigate how artificial intelligence (AI) is integrated into design studio. The overall research design is summarized in Figure 1, which outlines the sequence from case identification to analysis. Rather than measuring outcomes quantitatively, the focus is on identifying pedagogical patterns, challenges, and innovations across diverse studio contexts. The methodological orientation follows a cross-case thematic analysis of studio experiments conducted between 2022 and 2025, a period in which AI tools rapidly entered design education.

Figure 1.
Research Design



Case Selection

The analysis draws on a set of documented design studios where AI tools were actively integrated into architectural education. Through a systematic search across peer-reviewed journals, conference proceedings, and institutional reports, 16 cases were identified that provide qualitative insight into pedagogical processes. In addition, institutional websites and academic networks were consulted to capture recent or practice-oriented initiatives. Search terms included combinations of "AI design studio," "architectural education and AI," "generative AI and pedagogy," "prompt-based design," as well as their Turkish equivalents.

Inclusion was guided by three criteria:

1. Active use of AI tools in architecture or interior architecture education,
2. Integration into studio-based learning environments, and
3. Availability of qualitative insight into pedagogical processes and impacts (e.g., reflective commentary, case documentation).

The resulting sample represents diverse geographic, institutional, and pedagogical contexts, including North America, Europe, the Middle East, and Asia. While systematic, the selection process was not extensive: other relevant studios may exist but were excluded due to limited documentation, language barriers, or lack of accessible reporting. Accordingly, the 16 cases are treated as a purposive sample, selected for their capacity to yield rich pedagogical insights rather than to represent the entirety of AI-related studio practices worldwide.

Analytical Framework

Case analysis was guided by a four-part framework developed from the study's conceptual foundations. Drawing on theoretical constructs of human-AI co-creativity, each case was coded under one or more of the following pedagogical categories:

- Ideation and Conceptual Development (ID): AI as a generative partner in speculative exploration and conceptual framing.
- Prompt Literacy (PL): prompting as a situated act of design authorship, requiring narrative clarity and interpretive refinement.
- Critique Culture and Studio Dynamics (CSD): how AI reshapes peer critique, feedback loops, and discursive studio practices.
- Authorship, Ethics, and Reflexivity (AE): negotiation of creative agency, ethical responsibility, and reflective awareness in AI-supported workflows.

Data Analysis and Reliability

The framework served to translate the conceptual constructs of Table 1 into analytical categories, providing the coding scheme for case study analysis. A thematic content analysis was conducted in two stages:

- Categorization into the four thematic categories (ID, PL, CSD, AE), allowing multiple coding where appropriate (see Table 2).
- Cross-case discussion to identify shared pedagogical strategies, recurring challenges, and transformative practices.

To enhance reliability, the categorisation framework was revisited at multiple stages and cases were cross-checked with a second expert researcher until consensus was reached.

Scope and Limitations

The aim of the analysis is not generalization but the identification of emerging pedagogical patterns in AI-supported design education in the context of studio practice. The strength of the study lies in the diversity of institutions and practices examined; however, certain limitations remain. The analysis relies on published or publicly available documentation in English and Turkish, which means that additional studios, particularly those reported in other languages or in less formal formats, may not have been captured. Documentation also varied in depth, with some cases offering detailed pedagogical accounts and others more limited descriptions.

Results: Pedagogical Transformations in Design Education

As artificial intelligence becomes increasingly embedded in architectural design workflows, its presence in design education has moved beyond speculation into practice. Across diverse institutional settings, AI is being integrated into studio environments in ways that reconfigure how design is taught, learned, and critiqued. Rather than a uniform transformation, these changes manifest through a spectrum of approaches shaped by local pedagogical priorities, curricular philosophies, and cultural conditions.

Table 2 synthesizes 16 international studio cases and maps them across four pedagogical dimensions, shows that no studio

addresses all four dimensions equally; instead, each case emphasizes aspects depending on its context. Some studios, such as University of Illinois Urbana-Champaign's (Deutsch, 2025) or Özyeğin University's (Özorhon et al., 2025), span across all categories, highlighting AI's potential to be both a generative and reflexive partner in design. Others, such as Qingdao University of Technology's (Xu & Huang, 2024) or Kütahya University's (Buldaç, 2024), are more narrowly focused, using AI primarily for ideation or prompt experimentation, with limited engagement in critique or ethical reflection. Patterns of conjunction are also visible: nearly all cases mobilize AI as a catalyst for speculative ideation,

confirming its strong role in expanding conceptual exploration. By contrast, prompt literacy, critique culture, and reflexivity emerge as more unevenly addressed themes, producing divergences in how AI reshapes studio practice.

These thematic patterns provide the structure for the following discussion, which examines each dimension in turn, first ideation and conceptual development, then prompt literacy, followed by critique culture and studio dynamics, and finally authorship, ethics, and reflexivity, to trace how AI integration is diversifying the pedagogical logics of design education.

Table 2.

Distribution of Studio Cases Across Thematic Categories

Institution/Studio	ID	PL	CSD	AE
The University of Texas at Austin (University of Texas at Austin, 2024)	Speculative housing ideation via 50,000 AI variations	-	Collaborative critique, inclusive value systems	Ethics, sustainability, human agency
Özyeğin University (Özorhon et al., 2025)	Concept-driven ideation with scenarios/sketches	Prompt construction from section models, scenarios	Polyphonic critique on ambiguous outputs	Reflexive use of abstract images; student agency
Auburn University (Fares, 2025)	Iterative ideation; sensory design	-	Peer critiques on AI outputs	Authorship, bias, originality debates
Qingdao University of Technology (Xu & Huang, 2024)	Concept ideation with MJ images	Keyword refinement for outputs	-	-
Gdańsk University of Technology (Cudzik et al., 2024)	Green campus ideation via AI	Prompting as design/research method	-	Ethics, authorship, IP debates
University of Liverpool (Agkathidis et al., 2024)	Form-finding via AI morphogenesis	Prompt precision; tool aesthetics	-	Authorship, plagiarism, loss of craft debates
FMV Işık University (Karadağ & Ozar, 2025)	Iterative ideation and visual refinement	Prompt strategies: keywords vs. narratives	-	Ethical concerns and authenticity
MSA University (Sadek & Mohamed, 2023)	-	Narrative-to-prompt workflow	-	Authorship, co-creativity debates
Tongji University (Jin et al., 2024)	Programming briefs; early ideation with AI	-	Critiques on fragmented outcomes	Caution on authorship; efficiency vs. originality
Istanbul Technical University (Tong et al., 2023)	Sketching + AI fusion (ISO-meets-AI)	Mandatory keywords; prompt trials	Tutor vs. student evaluation gaps	-
Kütahya Dumlupınar University (Buldaç, 2024)	Film-based experimental ideation	Prompt trials across multiple tools	-	-
South Dakota State University (Mansour, 2024)	Sacred space ideation via MJ	-	Peer critique and ethical debates	Authorship, originality, agency risks
Ajman University (Hafiz, 2024)	Baroque typology exploration	Keyword-based prompts; tool testing	Peer critique on stylistic misalignments	Authorship, interpretive responsibility
Ariel-TUM-Carnegie Mellon collaboration (Dortheimer et al., 2023)	Speculative ideation from "Invisible Cities"	Prompt anatomy; tool comparisons	Fixation risks; peer critique via recordings	Agency, authorship vs. automation
Istanbul Sabahattin Zaim University (İşbilir & Bölükbaşı, 2025)	Utopia/Dystopia scenario framing	Narrative scaffolding with ChatGPT	-	Ethical-ecological responsibility
University of Illinois Urbana-Champaign (Deutsch, 2025)	Urban-scale ideation; metaphor prompts	Managing hallucinations	Errors reframed as critique objects	Authorship via curation and reflection

Ideation and Conceptual Development

This theme examines how AI models such as Midjourney have been used in design studios to stimulate early-stage ideation through image generation and speculative exploration, prompting students to engage in conceptual experimentation. Across design studios, AI has emerged as a generative partner in early-stage ideation, prompting students to reframe how they begin designing. At the University of Texas at Austin, Daniel Koehler's studio (2024) treated AI as a visual ideation engine: students produced thousands of hybrid images by merging text prompts with model photographs, expanding their conceptual search area through curation, iteration, and critical reflection. Students generated over 50,000 images in this process, then engaged in reflective evaluation to determine where conceptual value emerged. As Koehler notes in the studio syllabus, *"any algorithm, model, API, or platform is designed in particular ways, learns from a particular set of data, assumes a particular kind of workflow, and amplifies distinct assumptions on the application of computation to architecture"* (University of Texas at Austin, 2024). This reflective layer positioned AI as both a visual generator and a subject of critique and conceptual reframing.

Within a design studio course at Özyeğin University, a prompt-driven abstraction model was tested, where multi-modal and scenario-based prompts aligned visual production with conceptual intent (Özorhon et al., 2025). In practice, students first produced collages to express conceptual ideas and then translated these into textual inputs for Midjourney, which generated alternative images expanding their design exploration. As the workshop report notes, this process *"stimulated design ideas through visual ambiguity"* and encouraged experimentation with multi-modal prompts that merged textual descriptions, diagrams, and conceptual keywords (Özorhon et al., 2025). This method encouraged peer dialogue on platforms like Discord and positioned AI outputs as intuitive stimuli that enriched ideation through ambiguity and iteration.

At Auburn University, studio experiments with hybrid workflows, combining AI and hand drawing, encouraged divergent thinking, while also exposing challenges of aesthetic convergence and contextual sensitivity (Fares, 2025). Students were encouraged to iterate between freehand sketches and AI-generated images, using the final product to open speculative directions that could later be refined through drawing. Several participants reported that AI accelerated the early stages of ideation, allowing them to visualize multiple options in minutes rather than hours, while also producing unexpected spatial layouts that pushed them toward more unconventional solutions. At the same time, students noted significant limitations: some AI-generated spaces appeared compelling as atmospheric renderings but proved structurally incoherent or disconnected from programmatic requirements when examined more closely (Fares, 2025). These tensions revealed both the potential and the pitfalls of AI-enhanced ideation, and ultimately inspired critique sessions centred on ethics, authorship, and originality.

Qingdao University of Technology introduced Midjourney in a design studio, where students moved from AI-generated visuals to iterative development via sketching and CAD. The workflow supported conceptual diversity but required interpretive intervention to address performative gaps. As Xu and Huang (2024) report, students were asked to produce an initial concept document, generate early images in Midjourney, and then refine these through hand sketching and CAD modelling before reapplying the software for comparison. This cycle highlighted both the strengths and weaknesses of AI integration: while

Midjourney significantly accelerated ideation and encouraged experimentation with unconventional forms, students found that many outputs lacked structural feasibility and overlooked sustainability concerns, requiring critical evaluation and further development through conventional tools.

At Gdańsk University of Technology, a design studio experiment contrasted traditional workflows with AI-enhanced approaches, shifting the logic from 'plan as generator' to 'image as generator.' As Cudzik et al. (2024) describe, the experiment compared a first cohort designing a "green campus" through conventional sketching and modelling with a second cohort integrating AI tools such as Midjourney and DALL-E. Within the AI-enhanced group, three modes of practice emerged: a semi-traditional use of AI images for inspiration only; a hybrid approach where fragments of generated visuals were embedded into urban decisions; and a hybrid-interactive approach based on continuous prompt-image-evaluation loops, sometimes incorporating 3D massing models. While these workflows stimulated faster production of variant solutions and encouraged speculative thinking, some students struggled with conceptual stability, as the abundance of new images risked driving the design rather than supporting it. The results underscored both the creative potential and the pedagogical challenges of replacing "plan as generator" with "image as generator," prompting a reframing of design education as a form of "research-by-prompting" (Cudzik et al., 2024).

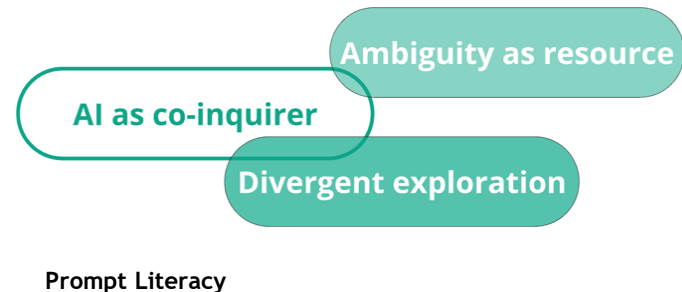
At the University of Liverpool, Agkathidis et al. (2024) structured a four-phase studio combining prompting, modelling, and architectural translation. Prioritizing conceptual morphogenesis over functional constraints, the studio improved creativity and fluency while surfacing tensions in authorship and spatial coherence. The workflow guided students through site analysis, AI-driven morphogenesis, translation into 3D models, and architectural resolution. Design experiments ranged from coral- and seashell-inspired forms translated into visitor centres to AI-blended façades materialised via 3D printing. Student evaluation confirmed the benefits: 82% reported AI as a useful tool for idea exploration and 77% stated it enabled compositions they could not have produced otherwise. Assessment results echoed this, with the AI-assisted cohort achieving higher average marks and the two top scores of the class. At the same time, instructors and students highlighted persistent challenges of control, as Midjourney often introduced unintended elements and resisted producing consistent perspectives (Agkathidis et al., 2024). These outcomes reveal both the generative potential and the limits of AI, underscoring its value when used for exploratory morphogenesis rather than as a shortcut to finished designs.

While each studio varied in tools and emphasis, commonalities emerged in how students used AI for speculative generation and iterative ideation. Together, these cases show that critically framed AI use enhances conceptual exploration. AI has the potential to support ambiguity, iteration, and reflective engagement, acting as a co-inquirer that expands how students imagine and develop design ideas. Beyond functioning as a generative engine, AI reframes the starting point of design itself, shifting emphasis from solution-finding toward open-ended exploration. At the same time, the variability of outcomes, ranging from productive ambiguity to conceptual instability, illustrates that the pedagogical value of AI in ideation depends less on the tools' capacity than on the critical frameworks that guide their use. In this sense, AI-assisted ideation represents both an opportunity and a challenge: it can democratize conceptual experimentation while also demanding new forms of scaffolding

to ensure that exploratory richness translates into meaningful design reasoning. These insights are summarized in Figure 2, which refines the analysis into two central dynamics: AI as a co-inquirer that stimulates divergent exploration, and ambiguity reframed as a pedagogical resource in conceptual development.

Figure 2.

Ideation and conceptual development central dynamics



Prompt Literacy

The integration of AI into design education has introduced a new form of literacy: prompting as a method of directing, interpreting, and refining visual output. During the final year interior design studio at FMV Işık University, students progressed from basic keywords to layered narrative inputs in Midjourney, resulting in more coherent spatial articulation and concept-driven outcomes (Karadağ & Ozar, 2025). In practice, a Midjourney workshop conducted in the fourth week of the design studio revealed distinct strategies: most students relied on single keywords, while smaller groups experimented with conjunction-based prompts or progressive layering. Survey results showed that keyword-only approaches often produced superficial or mismatched images, useful mainly as inspiration, whereas layered prompts created outputs that aligned more closely with students' design intentions and enriched projects with unexpected yet meaningful details. By the end of the semester, students reported that prompt-writing had evolved into a reflective design act, requiring narrative clarity, interpretive control, and iterative refinement to achieve both conceptual alignment and functional articulation (Karadağ & Ozar, 2025).

Similarly, at MSA University's experimental architectural design course, fictional scenario-based prompting stimulated both visual richness and deeper authorship, positioning prompt-writing as a reflective and generative act (Sadek & Mohamed, 2023). In practice, students were asked to write short fictional narratives and then translate them into prompts for platforms such as Midjourney and Craiyon. This process created an iterative loop between text and image, where narratives were revised alongside visual outputs, encouraging students to explore conceptual alternatives through storytelling. Reflections from the studio emphasized that prompt-writing in this context was not simply a technical operation but a creative act that shaped authorship, interpretation, and conceptual clarity (Sadek & Mohamed, 2023).

However, several cases underline the fragility of this process when left unguided. At Tongji University, an AI-assisted architectural programming and design course experimented with integrating tools such as ChatGPT, Midjourney, and Stable Diffusion (Jin et al., 2024). While students actively used these platforms, particularly for problem analysis, data gathering, and conceptual briefing, the design stage revealed challenges. Outputs were often fragmented and difficult to refine, leading to a reliance on sketching and CAD methods to regain control. Instructors similarly stressed that AI tools could enrich

programming tasks but warned against over-reliance during design development, where architectural coherence and intentionality remained difficult to secure (Jin et al., 2024). This case underlines the fragility of AI use when not pedagogically scaffolded, demonstrating how limited prompt literacy can produce unstable or incoherent outcomes, thereby reinforcing the need for structured prompt literacy and critical mediation.

The Istanbul Technical University's "ISO-meets-AI" experiment showed that limited prompt literacy led to passive adaptation of AI-generated forms, weakening representational control (Tong et al., 2023). Implemented in the Visual Communication I course with 50 first-year students, the three-step assignment required learners to first produce orthographic and isometric drawings of geometric compositions, then generate Midjourney images using mandatory keywords such as "isometric projection," "shade and shadow," and "8K rendering," and finally merge these outputs into composite representations. While tutors observed that all students incorporated textures and colours from AI images, a significant proportion of students reported difficulties transferring such elements, highlighting gaps between intention and outcome. The experiment demonstrated that, although students quickly adapted to AI tools and saw them as valuable for future design work, the lack of prompt literacy often resulted in unexpected outputs and passive reliance on generated forms (Tong et al., 2023). This reinforced the conclusion that without explicit scaffolding, AI integration risks undermining representational agency rather than enhancing it.

At Kütahya Dumlupınar University, in a third-year interior design studio, cinematic prompting helped with speculative iteration but also exposed limitations in precision and coherence (Buldaç, 2024). Students selected films such as *Inception*, *Passengers*, and *Ex Machina* and reinterpreted their spatial settings through AI tools including Midjourney, Lexica, Playground, and DALL-E. This cinematic approach stimulated rapid idea generation and supported exploration of atmosphere and narrative-driven design. Student reflections emphasized speed, revision flexibility, and the capacity to test multiple alternatives as key advantages. Yet the process also revealed significant drawbacks: many tools struggled to correctly interpret detailed prompts, while some outputs, particularly from Playground, produced incoherent or unrealistic results detached from the intended scene. These outcomes illustrate both the speculative potential and the fragility of AI-supported workflows when not accompanied by strong conceptual framing and critical guidance (Buldaç, 2024).

These cases demonstrate that prompting is not a neutral technical step, but a situated act of design authorship that demands narrative clarity, interpretive judgement, and critical pedagogical framing. Across the different studio contexts, prompt literacy emerges less as a mechanical input than as a reflective practice of meaning-making, capable of fostering interpretive responsibility and iterative refinement. At the same time, its fragility remains: without scaffolding, prompting risks collapsing into passive replication or conceptual instability. As such, prompt literacy stands as both a creative skill and a pedagogical frontier, redefining the relationship between authorship, representation, and critical agency in AI-supported design education. These insights are synthesized in Figure 3, which frames prompt literacy not as a linear progression but as branching pathways, from basic keywords to layered narratives and cinematic approaches, each highlighting both potentials and weaknesses in design education.

Figure 3.
Branching pathways of prompt literacy



Critique Culture and Studio Dynamics

At South Dakota State University, the studio “The Sacred in Between” used Midjourney to generate speculative images on transcendence and sacred space, which served as provocations for structured peer critique on authorship, ambiguity, and design intention (Mansour, 2024). Beyond sparking visual exploration, students described the process as “sketching with words,” producing hundreds of collages that broadened their design repertoire and helped overcome creative blocks. Class debates soon turned toward ethical concerns about originality and overreliance, highlighting risks of diminished human agency when AI becomes the primary design driver. The vertical learning curve of mastering prompts further underscored the need for guided critique sessions, ensuring that students remained active agents rather than passive curators of computational output. Reflective assignments and scaffolded discussion helped students move from intuitive exploration toward critical evaluation of AI’s interpretive limits (Mansour, 2024).

Within a studio setting at Ajman University, Baroque typologies were explored through Midjourney, PromeAI, and OpenArt, with students generating and analyzing historical forms using curated keyword lists (Hafiz, 2024). The iterative process revealed both the strengths of AI, such as enhanced rendering of light, shadow, and materiality, and its limitations, including stylistic distortions, misplaced influences, and mislabeled building types. Students often described the tools as “a baby” requiring repeated correction, which foregrounded their interpretive responsibility in managing AI outputs. This critical engagement turned stylistic misalignments into moments of reflection, compelling students to interrogate the conceptual gaps between canonical architectural references and generative results. Through this process, authorship, ethical awareness, and reflective judgment were articulated as critical dimensions of critique culture within AI-supported studio pedagogy (Hafiz, 2024).

The international workshop jointly hosted by Ariel University, the Technical University of Munich, and Carnegie Mellon University provided a collaborative critique setting where students evaluated and refined hybrid workflows that combined generative tools with conventional BIM and CAD platforms (Dortheimer et al., 2023). While the initial excitement centred on the visual novelty of AI outputs, critiques quickly shifted toward deeper questions of authorship, decision-making, and process integration. Students became particularly fixated on MidJourney’s striking imagery, which sparked debates on overreliance and the risk of diminished agency, whereas the more ambiguous results from DALL-E and Stable Diffusion invited greater reinterpretation and dialogic discussion of design intent. By moving between speculative generation and architectural resolution, students developed comparative awareness of AI’s potential and limits. Screen recordings and group reflections positioned AI not as a provider of finished solutions but as a

catalyst for studio debate, collective interpretation, and the negotiation of agency within evolving critique culture (Dortheimer et al., 2023).

Collectively, these cases show that critique culture is evolving into a more discursive and interpretive space, where the focus shifts from form to process. AI’s presence in the studio invites students to question representational norms, reflect on authorship, and articulate design intent in dialogue with algorithmic unpredictability. These dynamics are summarized in Figure 4, which shows AI outputs as branching triggers, activating peer critique, shaping design agency, and provoking ethical reflection, and thus reshaping the culture of critique from form toward process.

Figure 4.
Critique culture and studio dynamics on AI outputs



Authorship, Ethics, and Reflexivity

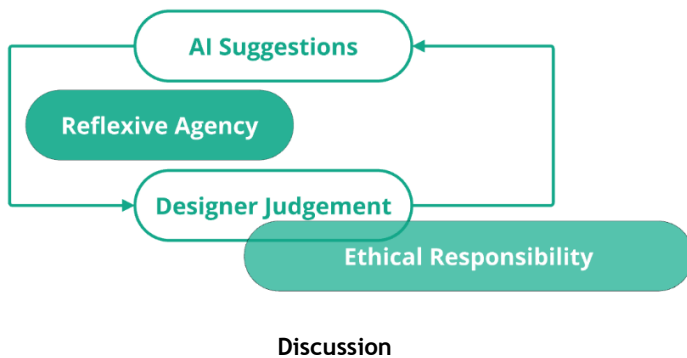
At İstanbul Sabahattin Zaim University, a fourth-year interior design studio integrated AI-assisted creative writing into a climate-focused project entitled “Between Utopia and Dystopia: Which Future? Which Place?” (İşbilir & Bölükbaşı, 2025). Over a three-week workshop, students employed ChatGPT to develop speculative narratives addressing ecological collapse, resource scarcity, and social inequality. The process unfolded through concept mapping, scenario drafting, and visual storyboarding, with AI providing linguistic and analytical scaffolding at each stage. Assessment criteria emphasized conceptual depth, consistency, integration of social and environmental variables, and the reflective use of AI tools. Findings showed that AI-supported scenario writing enhanced students’ ability to situate design proposals within ethical and interdisciplinary frames, compelling them to negotiate value-driven choices while articulating spatial futures. Authorship extended beyond formal design outputs to include narrative framing, ethical responsibility, and reflexive critique, illustrating how text-based AI can foster critical inquiry and sustainability-oriented imagination within studio culture (İşbilir & Bölükbaşı, 2025).

At the University of Illinois Urbana-Champaign, a graduate design studio positioned AI as an interpretive collaborator in tackling the urgent challenge of affordable housing (Deutsch, 2025). Early exercises, such as the provocative prompt “*In what ways is a building like an octopus?*”, reframed AI not as software to be mastered but as a conversational partner that provoked lateral thinking and metaphorical associations. Across the semester, students used AI to test urban-scale housing strategies, optimize layouts, and analyze environmental performance, while also confronting the unpredictability of generative outputs. Hallucinations, such as AI misidentifying a concrete structure as timber, were reinterpreted as design provocations that pushed students to reconsider material strategies, often to their project’s benefit. This dynamic highlighted that AI could augment creativity only when mediated by human judgement, with authorship located in the reflective choices designers made in curating, correcting, or augmenting algorithmic suggestions. AI expanded students’ interpretive responsibility, underscoring that

critical authorship must negotiate between automation and intent (Deutsch, 2025).

Together, these cases demonstrate that questions of authorship and ethics in AI-supported studios extend well beyond concerns of originality or plagiarism. Authorship is increasingly defined through processes of negotiation between narrative framing and spatial design, between automation and human intent, and between efficiency and responsibility. Ethical awareness emerges not only in explicit debates about sustainability or social equity, but also in the everyday interpretive choices students make when curating, correcting, or reframing AI outputs. Reflexivity, in turn, becomes a critical pedagogical skill, enabling students to interrogate the limits of generative tools while positioning themselves as active agents within hybrid workflows. AI invites students to question their role as authors, defend design decisions, and engage with tools as epistemic partners rather than generators of finished solutions. In this sense, AI does not displace human authorship but reconfigures it, compelling architectural education to cultivate a more distributed, critical, and ethically improved understanding of creative agency. These dynamics are synthesized in Figure 5, which visualizes authorship as a negotiation between AI suggestions and designer judgement, generating reflexive agency while situating ethical responsibility directly within human decision-making.

Figure 5.
Interaction between AI and designer



Discussion

The case analysis highlights that AI integration in architectural design education is not a uniform phenomenon, but a set of differentiated practices shaped by local pedagogical aims and institutional cultures. Multiple case studies across Turkey, China, and Europe confirm this diversification, from Kütahya and Qingdao to Özyeğin and Gdańsk (Buldaç, 2024; Cudzik et al., 2024; Jin et al., 2024; Özorhon et al., 2025). The findings reveal that pedagogical implications are not limited to technical proficiency; they extend toward cultivating reflective, ethical, and critical forms of engagement, as emphasized by Hafiz (2024) and Shneiderman (2020).

As Schulman (2023) observes in *Architectural Record*, artificial intelligence is “both a tool and a crisis,” requiring not only technical fluency but also cultural and ethical reorientation. While tools such as Midjourney may reduce the need for manual rendering, they intensify the demand for design judgement, critical literacy, and conceptual clarity. This point resonates with Clark and Chalmers’ (1998) notion of the extended mind and with Shneiderman’s (2020) call for human-centered AI. David Ruy underscores the same concern, noting that “the real value in education comes in judgement and curation, not elbow grease” (as cited in Schulman, 2023).

Across the cases, ideation and conceptual development emerged as the most consistently reconfigured dimension. Students often used AI to rapidly visualize and iterate on abstract ideas. Agkathidis et al. (2024) and Fares (2025) show how studios encouraged this prompt-and-curate logic, while the University of Texas at Austin (2024) demonstrated its capacity to expand the conceptual search space. At the same time, studies from Qingdao and Gdańsk warn that outputs can remain visually compelling but intellectually thin when left unstructured (Xu & Huang, 2024; Cudzik et al., 2024). These findings suggest that AI should be framed not simply as a generative engine, but as a co-inquirer provoking reflection, speculation, and judgement.

The evolution of studio culture under the influence of AI appears in changing evaluative norms and the reconfiguration of peer critique practices. Özorhon et al. (2025), Dortheimer et al. (2023), and Mansour (2024) all describe how critique shifted toward authorship and process. Peer critiques and desk reviews increasingly focused less on the surface quality of outputs and more on how students interpret, refine, and contextualize them. This reframing reveals a shift in evaluative criteria, where authorship is judged by the reflective choices students exercise when curating, correcting, or reframing algorithmic suggestions (Hafiz, 2024). Critique culture thus becomes a site for negotiating agency, responsibility, and ethics.

Prompt literacy stands out as a fragile yet essential capability. Effective prompting requires narrative framing, interpretive control, and iterative refinement. Sadek and Mohamed (2023) show how narrative prompting fostered deeper authorship, while Jin et al. (2024) and Buldaç (2024) warn that unguided use can collapse into incoherence. Without structured support, outputs risk remaining superficial, as also demonstrated in Tong et al.’s (2023) teaching experiment. Consequently, prompt literacy must be integrated into curricula as a core design skill, aligned with ethical reasoning and contextual judgment rather than treated as a peripheral technical ability (Karadağ & Ozar, 2025).

The synthesis also exposes a persistent tension between student enthusiasm and institutional preparedness. Agkathidis et al. (2024) and Fares (2025) document how students adapt quickly to Midjourney or ChatGPT, reporting gains in efficiency and creative exploration, while Alshahrani and Mostafa’s (2025) survey reveals the contrast with faculty concerns. Sadek and Mohamed (2023) likewise note faculty hesitation over overreliance and disciplinary erosion, echoing broader debates about curricular preparedness (Makarouni, 2024). This difference illustrates that questions of authorship, reflexivity, and responsibility extend beyond studio pedagogy to institutional and cultural levels of architectural education (Wilson & Daugherty, 2018).

Overall, AI expands representational capacities, yet its transformative value in design studio lies in how it reshapes processes of meaning-making, authorship, and interpretation. Cross (2011) and Dorst and Cross (2001) remind us that design creativity emerges from co-evolving problems and solutions, a point extended by Gaggioli et al. (2025) in their framework of extended creativity. These shifts point toward the need for new pedagogical cultures, ones that embrace uncertainty, foster ethical imagination, and support students in navigating co-creative work with intelligent systems (Shneiderman, 2020; Wilson & Daugherty, 2018). The synthesis presented in Table 3 combines these findings, offering a structured view of key observations and their pedagogical implications.

Table 3.*Synthesis: Towards a Reflective Pedagogy of AI*

Theme	Key Observations	Pedagogical Implications
Ideation and Conceptual Development	AI stimulates divergent thinking and speculative workflows; shifts focus from solution to exploration.	Frame AI as co-inquirer; emphasize ambiguity and iterative inquiry.
Prompt Literacy	Effective prompting requires narrative framing and interpretive control; unstructured use leads to superficiality.	Integrate prompt literacy as a critical design skill within structured curricula.
Critique Culture and Studio Dynamics	AI outputs serve as discursive triggers, critique shifts toward authorship, process, and ethics.	Reframe critique practices to prioritize process over form and engage with algorithmic intent.
Authorship, Ethics, and Reflexivity	Students renegotiate authorship; reflexivity and ethical awareness become integral to studio practice.	Embed ethical reasoning and reflective authorship within studio culture and learning outcomes.

Conclusion and Recommendations

AI's value in architectural education lies less in automating solutions and more in fostering inquiry. Across case studies, AI consistently revealed itself as a co-inquirer, capable of provoking ideation and surfacing tensions around aesthetics, ethics, and representation. This provocation often led to richer critique cultures, expanded conceptual agility, and deeper forms of self-reflection.

However, the study also highlights key limitations. Many institutions still lack structured pedagogical frameworks to scaffold AI integration. Prompt literacy, ethical reasoning, and authorship awareness often emerge unevenly, and students may fall into superficial engagements with generative tools without critical mediation. Concerns remain regarding aesthetic convergence, data bias, and the removal of cultural specificity in AI-generated outputs. These risks underscore the need for pedagogical intentionality: AI should be approached as a platform for dialogue, critical judgement, and conceptual exploration, not just as a convenient tool. Another challenge is the unequal access to AI tools and computational knowledge across global institutions. Limited resources affect both the availability of these tools and the ways they are used and evaluated.

Future research should explore how AI-based pedagogy functions across different social, geographic, and disciplinary contexts to support more inclusive and equitable education. For the Turkish context, the reviewed cases reveal both opportunities and challenges. While they demonstrate student enthusiasm and conceptual experimentation, they also highlight the need for structured curricula to cultivate prompt literacy and ethical reflexivity. Future research in Türkiye should expand beyond isolated studio experiments to systemic curricular reform and faculty training.

Moving forward, several key directions emerge for the evolution of AI-supported architectural education. First,

curriculum development must progress beyond isolated workshops to encompass a more integrated approach, embedding AI throughout both foundational and advanced design courses. Equally important is faculty development; educators need to be equipped with not only technical proficiency but also conceptual clarity, ideally supported through interdisciplinary collaboration. Furthermore, a critical pedagogical orientation is necessary—one that embeds ethical reflection into all stages of the design process, including prompt formulation and critique practices. Student autonomy should also be prioritized, enabling learners to define their roles within AI-augmented workflows and to cultivate agency in how they engage with computational tools. Lastly, longitudinal research is essential to assess the evolving impacts of AI on creativity, learning processes, and student identity over time.

Finally, the future of architectural education will not be defined only by AI's capabilities, but by how institutions respond to its provocations. A reflective pedagogy of AI demands more than technological implementation, it requires epistemic modesty, ethical clarity, and pedagogical courage. By embracing AI as a dialogic and conceptual partner, architectural education can cultivate a new generation of critically adaptive designers: not just users of advanced tools, but interpreters, questioners, and co-creators.

Ethics Committee Approval Certificate: The author declared that an ethics committee approval certificate is not required.

Peer-review: Externally peer-reviewed.

Acknowledgements: The author sincerely thanks Assoc. Prof. Dr. Faruk Can Ünal for his valuable contribution in cross-checking the case analysis and supporting the reliability of the categorization framework.

Conflict of Interest: The author has no conflicts of interest to declare.

Financial Disclosure: The author declared that this study has received no financial support.

References

- Agkathidis, A., Song, Y., & Symeonidou, I. (2024). AI-assisted design: Utilising artificial intelligence as a generative form-finding tool in architectural design studio teaching. In *Proceedings of the 42nd International Conference on Education and Research in Computer Aided Architectural Design in Europe (eCAADe 2024)* (pp. 619-628). <https://doi.org/10.52842/conf.ecaade.2024.2.619>
- Alshahrani, A., & Mostafa, A. M. (2025). Enhancing the use of artificial intelligence in architectural education - case study Saudi Arabia. *Frontiers in Built Environment*, 11, Article 1610709. <https://doi.org/10.3389/fbuil.2025.1610709>
- Boden, M. A. (1998). Creativity and artificial intelligence. *Artificial Intelligence*, 103(1-2), 347-356. [https://doi.org/10.1016/S0004-3702\(98\)00055-1](https://doi.org/10.1016/S0004-3702(98)00055-1)
- Boden, M. A. (2004). *The creative mind: Myths and mechanisms* (2nd ed.). Routledge.
- Buldaç, M. (2024). Deneysel tasarım sürecinde yapay zekâ araçlarının kullanımı: iç mimarlık eğitiminde bir ders modeli çıktıları. *Sanat ve Tasarım Dergisi*, 14(2), 69-91. <https://doi.org/10.20488/sanattasarim.1602366>
- Chandrasekera, T., Hosseini, Z., & Perera, U. (2024). Can artificial intelligence support creativity in early design processes? *International Journal of Architectural Computing*, 23(1), 122-136. <https://doi.org/10.1177/14780771241254637>
- Cross, N. (2011). *Design thinking: Understanding how designers think and*

- work. Oxford: Berg.
- Clark, A., & Chalmers, D. (1998). The extended mind. *Analysis*, 58(1), 7-19. <https://doi.org/10.1093/analysis/58.1.7>
- Cudzik, J., Nyka, L., & Szczepański, J. (2024). Artificial intelligence in architectural education - green campus development research. *Global Journal of Engineering Education*, 26, 20-25.
- D'souza, N., & Dastmalchi, M. R. (2024). Architectural Creativity Stranded at Mid Journey? Evaluating Creative Potential of Prompts and Images in Generative AI. In *International Conference on Design Computing and Cognition* (pp. 224-240). Cham: Springer Nature Switzerland.
- Deutsch, R. (2025, January 15). Architecture students on AI. Common Edge. <https://commonedge.org/architecture-students-on-ai/>
- Dorst, K. (2011). The core of "design thinking" and its application. *Design Studies*, 32(6), 521-532. <https://doi.org/10.1016/j.destud.2011.07.006>
- Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem-solution. *Design Studies*, 22(5), 425-437. [https://doi.org/10.1016/S0142-694X\(01\)00009-6](https://doi.org/10.1016/S0142-694X(01)00009-6)
- Dortheimer, J., Schubert, G., Dalach, A., Brenner, L., & Martelaro, N. (2023). Think AI-side the Box! Exploring the usability of text-to-image generators for architecture students. In W. Dokonal, U. Hirschberg, & G. Wurzer (Eds.), *eCAADe 2023: Digital design reconsidered* (Proceedings of the International Conference on Education and Research in Computer Aided Architectural Design in Europe, Vol. 2, pp. 567-576). eCAADe. <https://doi.org/10.52842/conf.ecaade.2023.2.567>
- Fares, G. (2025). Integrating AI in the creative process: A case study in interior design education. *Art and Design Review*, 13(2), 140-158. <https://doi.org/10.4236/adr.2025.132010>
- Gaggioli, A., Bartolotta, S., Ubaldi, A., Gerardini, K., Sarcinella, E. D., & Chirico, A. (2025). Extended Creativity: A Conceptual Framework for Understanding Human-AI Creative Relations (arXiv:2506.10249v2). arXiv. <https://arxiv.org/abs/2506.10249v2>
- Hafiz, D. (2024). Shaping tomorrow: The impact of AI on architectural history and interior design education. *Evolutionary Studies in Imaginative Culture*, 8(2), 357-367. <https://doi.org/10.70082/esiculture.vi.1052>
- Han, J., Forbes, H., and Schaefer, D. (2019). An Exploration of the Relations between Functionality, Aesthetics and Creativity in Design. *Proceedings of the Design Society: International Conference on Engineering Design*, 1(1), 259-268. <https://doi.org/10.1017/dsi.2019.29>
- İşbilir, A., & Bölükbaşı, M. (2025). Yaratıcı senaryo yazımında yapay zekânın rolü: İç mimarlık eğitiminde yenilikçi bir yaklaşım. *İstanbul Sabahattin Zaim Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 7(1), 40-49. <https://doi.org/10.47769/izufbed.1633624>
- Jin, S., Tu, H., Li, J., Fang, Y., Qu, Z., Xu, F., Liu, K., & Lin, Y. (2024). Enhancing Architectural Education through Artificial Intelligence: A Case Study of an AI-Assisted Architectural Programming and Design Course. *Buildings*, 14(6), 1613. <https://doi.org/10.3390/buildings14061613>
- Karadağ, D., & Ozar, B. (2025). A new frontier in design studio: AI and human collaboration in conceptual design. *Frontiers of Architectural Research*. <https://doi.org/10.1016/j.foar.2025.01.010>
- Makarouni, E. (2024, June). Should AI become a mandatory part of the architecture school curriculum? *Architizer*. <https://architizer.com/blog/inspiration/stories/ai-architecture-school-curriculum/>
- Mansour, N. (2024). Redefining architectural education: Navigating the integration of AI in design education. In *ACSA 112th Annual Meeting: Disrupters on the Edge* (pp. 172-179). Vancouver, BC. <https://doi.org/10.35483/ACSA.AM.112.24>
- Özorhon, G., Nitelik Gelirli, D., Lekesiz, G., and Müezzinoğlu, C. (2025). AI-assisted architectural design studio (AI-a-ADS): How artificial intelligence join the architectural design studio? *International Journal of Technology and Design Education*. <https://doi.org/10.1007/s10798-025-09975-0>
- Sadek, M., & Mohamed, N. A. G. (2023). Artificial Intelligence as a pedagogical tool for architectural education: What does the empirical evidence tell us? *MSA Engineering Journal*, 2(2), 133-148. <https://doi.org/10.21608/MSAENG.2023.291867>
- Sarkar, P. and Chakrabarti, A. (2011), "Assessing design creativity", *Design Studies*, 32(4), 348-383. <https://doi.org/10.1016/j.destud.2011.01.002>
- Shneiderman, B. (2020). Human-centered artificial intelligence: Reliable, safe and trustworthy. *International Journal of Human-Computer Interaction*, 36(6), 495-504. <https://doi.org/10.1080/10447318.2020.1741118>
- Schulman, P. (2023, September 7). Learning AI: Are architecture schools ready? *Architectural Record*. <https://www.architecturalrecord.com/articles/16344-learning-ai-are-architecture-schools-ready>
- Tong, H., Türel, A., Şenkal, H., Yagci Ergun, S. F., Güzelci, O. Z., & Alaçam, S. (2023). Can AI Function As A New Mode of Sketching: A Teaching Experiment with Freshman. *International Journal of Emerging Technologies in Learning (IJET)*, 18(18), 234-248. <https://doi.org/10.3991/ijet.v18i18.42603>
- University of Texas at Austin. (2024, September 12). Architecture students designing with AI. UT News. <https://news.utexas.edu/2024/09/12/architecture-students-designing-with-ai/>
- Xu, C., & Huang, Y. (2024). Technological Innovation in Architectural Design Education: Empirical Analysis and Future Directions of Midjourney Intelligent Drawing Software. *Buildings*, 14(10), 3288. <https://doi.org/10.3390/buildings14103288>
- Wilson, H. J., & Daugherty, P. R. (2018). Collaborative intelligence: Humans and AI are joining forces. *Harvard Business Review*. <https://hbr.org/2018/07/collaborative-intelligence-humans-and-ai-are-joining-forces>