Journal of
Design Studio
v:7 n:1 July 2025

AI-Guided Concept to Design Output: A Comparative Visual Analysis Based on SSIM, Histogram, and LBP in an Interior Architecture Studio

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Research Article / Received: April 4th 2025, Revised: June 27th 2025, Accepted: June 28th 2025
Refer: Harmanbasi, T., (2025), AI-Guided Concept to Design Output: A Comparative Visual Analysis Based on SSIM, Histogram, and LBP in an Interior Architecture Studio, Journal of Design Studio, V.7 N.1, pp 217-233
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DOI: 10.46474/jds.1670238 https://doi.org/10.46474/jds.1670238

Abstract: Artificial intelligence (AI) has rapidly become a transformative force in design disciplines, including interior architecture. With the increasing integration of AI tools into the design process, interior architecture education faces new pedagogical opportunities and challenges. This study examines how second-year interior architecture students utilized artificial intelligence (AI)-supported visual generation tools during the conceptualization and development of their design projects, and investigates the impact of these tools on creative processes within the context of the 'Interior Architecture Project I' design studio conducted at Istanbul Sabahattin Zaim University.

Ten second-year interior architecture students participated in a semester-long project focusing on the adaptive reuse of the historic Kibrithane Building, redesigned as a restaurant interior. At the beginning of the course, students generated concept visuals using AI tools such as Midjourney, Canva and Bing, etc. These images were based on their self-authored prompts and were intended not as final design templates but as visual stimuli to encourage reflective engagement and conceptual development. Students developed functional layouts, material, color strategies, and 3D models based on their AI-inspired concepts throughout the semester.

A comparative analysis was conducted between the AI-generated images and the final student designs using qualitative observations and quantitative image analysis methods: Structural Similarity Index (SSIM), Histogram Comparison, and Local Phase Descriptor (LPD). The evaluation focused on four key criteria: form, material, color, and spatial organization. The findings emphasize that AI tools, when used reflectively, act as creative catalysts rather than prescriptive design solutions. The study concludes that AI integration in design studios can support conceptual exploration, foster critical thinking, and maintain students' creative autonomy. It also recommends that educators guide students in interpreting and transforming AI outputs through aesthetic, functional, and contextual reasoning rather than applying them directly. This research contributes to the evolving discourse on AI in design education by highlighting its pedagogical potential and offering a framework for structured, critical integration within interior architecture curricula.

Keywords: Artificial intelligence, Interior architecture studio, AI-generated concepts, Creative process, Artificial intelligence in design education

1. Introduction

Interior architecture education is a field where technical knowledge and aesthetic skills are acquired and a process in which students' creative thinking, problem-solving, and multidimensional design development skills are supported. Historically, interior architecture education in Türkiye started in 1925 at the Sanayi-i Nefise Mekteb-i Alisi. However, the practical training of professionals dates back to the 1970s [Kaptan, 1998]. Interior architecture education has shaped two main approaches during this process: The first is decoration-oriented programs; the second is programs with a more holistic approach that associates interior architecture with disciplines such as architecture, industrial design, and landscape architecture [Çetin, 2021].

Educational programs have undergone significant changes with the impact of digital transformation on a global scale. Particularly since the 1980s, integrating computer-aided design (CAD) software into education has enabled the development of new means of expression in interior architecture studios. This digital transformation has recently gained a new dimension by integrating artificial intelligence (AI) supported tools into the design process. Interior architecture students now have the opportunity to guide decisions about the design object and the design process with AI-supported data and visualization tools.

Design studios are one of the most critical areas of interior architecture education, where students transform creative thoughts into concrete outputs. The studio structure covers a multidimensional process from conceptual research to technical drawings, from material selection and spatial organization to presentation skills. Especially in the early stages of the studio, students often utilize visual references (e.g., Pinterest, Google Images, etc.) in the concept development process. However, this method can sometimes lead to repetitive design patterns that are far from original. Artificial intelligence-based visual production tools have the potential to break this cycle by enabling students to produce original visual outputs with scenarios and keywords of their choice.

This study was produced from the paper “The Effect of Artificial Intelligence on Interior Architecture Design Studio,” presented at the ICMEK 5th International Congress on Interior Architecture Education held in 2024. This analysis examines the effects of artificial intelligence-supported tools in interior architecture studios on students' design process. The study evaluated the contribution of artificial intelligence to the design process through a project studio conducted with 2nd-year students of Istanbul Sabahattin Zaim University Department of Interior Architecture. The conceptual visuals produced by the students with artificial intelligence and the three-dimensional (3D) designs they created at the end of the semester were compared and analyzed in terms of visual similarity, design principles, and spatial atmosphere.

This research is grounded in two interrelated pedagogical frameworks: Donald Schön’s concept of the “reflective practitioner” and David Kolb’s experiential learning theory. Schön (1983) argues that professional knowledge is not merely applied but constructed through action and reflection. In the design studio, students engage in reflection-in-action as they critically respond to complex design challenges during the process and in reflection-on-action as they assess their decisions retrospectively. The introduction of AI-generated visual inputs in this study catalyzed both types of reflection, enabling students to interpret, modify, or contest the initial data based on design intentions and user needs.

In design pedagogy, Donald Schön's concept of the 'reflective practitioner' emphasizes learning through action and reflection rather than through the passive transmission of knowledge. According to Schön (1983), design is an inherently reflective process in which professionals engage in reflection-in-action—thinking and making decisions while designing—and reflection-on-action, which involves evaluating and learning from one's design outcomes retrospectively. In this study, integrating AI-generated visual inputs into the design process is positioned not as a shortcut to solutions but as a stimulus for reflective thinking. Students were encouraged to critically interpret and transform the AI outputs based on contextual needs, user scenarios, and spatial constraints. This reflective engagement with AI tools aligns with Schön's framework, suggesting that the design studio can serve as a dynamic space for constructing knowledge through iterative thinking, making, and evaluating.

Kolb's experiential learning model (1984), which consists of a cyclical process—concrete experience, reflective observation, abstract conceptualization, and active experimentation—complements Schön's approach by emphasizing how learners transform experience into knowledge (Figure 1). Within this framework, AI tools functioned as mediators that facilitated iterative exploration: students generated visual content (concrete experience), critically reviewed AI outputs (reflective observation), redefined design ideas (abstract conceptualization), and applied them in their final studio projects (active experimentation). The interplay of these pedagogical models underscores the studio not as a site of passive instruction, but as a dynamic environment for reflective inquiry, experimentation, and creative authorship—particularly when augmented by emerging technologies such as artificial intelligence.

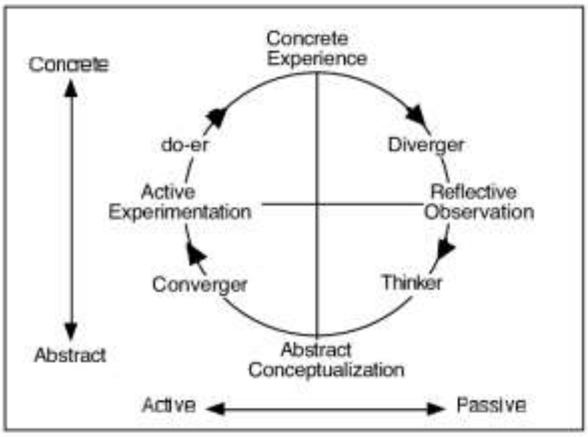

Figure 1: *Kolb's experiential learning model (Smulders, 2011)*

Students were encouraged to engage with the AI-generated images not as fixed templates but as fictional design experiments. In line with Schön's (1983) reflective practitioner model, students were guided to question, reinterpret, and adapt AI outputs through iterative critique and personal design logic—an approach fostering reflection-in-action.

Moreover, the learning cycle proposed by Kolb (1984) provided an implicit pedagogical structure throughout the design process. The AI-generated image was a concrete experience, prompting students to engage in reflective observation as they analyzed and critiqued the outputs. Through this, they entered the phase of abstract conceptualization, developing personalized design ideas, which were later tested through active experimentation in spatial modeling and rendering. The entire studio process was thus intentionally aligned with these pedagogical theories, ensuring that the integration of AI technologies did not replace creative thinking but instead supported it through structured, reflective engagement.

In this context, form, material, color, and space criteria were determined based on the basic design elements and principles (Ching, 2007; Güngör, 2005; Aydınlı, 1992, 1993) widely accepted in the design literature. The form criterion was defined through components such as point, line, plane, volume, and direction, while the material was evaluated in terms of texture and surface quality. The color criterion included tone, value, and harmony, whereas space was considered with interior atmosphere, the balance of void and mass, and the use of light. These four criteria were selected to enable a multidimensional analysis of how and to what extent AI-generated concept visuals influenced students. Therefore, it aims to evaluate how effective artificial intelligence can be in terms of originality, creativity, and process management in interior architecture education.

This study employed a comparative visual analysis to examine the relationship between each student's AI-generated concept image and their final 3D studio design. The researcher, who also served as the studio instructor, conducted the evaluation and observed each student's design development throughout the semester. A structured rubric—developed in alignment with the predefined criteria—was used to assess the design outcomes based on four key dimensions: volumetric composition (form), surface and material texture (material), color scheme and visual contrast (color), and spatial organization and experiential quality (space). Although a single evaluator carried out the assessment, the use of standardized definitions, consistent evaluation procedures, and visual documentation helped reduce subjectivity and maintain analytical rigor. This approach allowed for a context-sensitive and pedagogically informed interpretation of each student's creative engagement with AI tools.

2. Literature Review

Artificial intelligence (AI) has increasingly emerged in design disciplines in recent years. AI technologies integrated into the design process enable visualization of design outputs and influence multidimensional areas such as data analysis, decision-making, form creation, user experience, and sustainability. Architecture and interior architecture have also been significantly affected by the transformation.

Generally, studies on the use of AI in architecture are categorized under two main headings. The first group focuses on integrating artificial intelligence into the usage phases of the building. In these approaches, AI is used to optimize building performance with sensors, systems that analyze user movements, and automation-based scenarios. Examples in this field are generally developed on smart building and smart housing systems [Tomaş, 2019; Uzunali, 2003; Yalkı, 2001]. In addition, researchers such as Üstün [2020] examined the contribution of these systems to sustainability, energy efficiency, and user comfort.

The second group of studies are approaches where AI is used directly in the design process. The studies focus on using AI algorithms in early design stages such as planning, form development, and layout. Researchers such as Baydoğan [2013] and Kayış [2019] have developed models for creating site plans with the help of artificial intelligence. Özkan [2022), Çerçi [2022], Akçan [2022], and Sanalan [2022] evaluated the impact of AI on architectural form, especially visual production, design proposal diversity, and integration with parametric approaches.

Kahraman et al. [2024] evaluated AI integration in interior design education by comparing student projects that used different levels of prompt quality in generating concept images. The study found no significant difference in creativity scores but highlighted that effective adaptation of AI-generated content to design context is key. The authors conclude that AI supports rather than replaces design thinking and recommend further exploration of hybrid AI approaches in education.

Recent studies have also begun to explore how interior architecture students perceive and interact with AI technologies. Cao, Aziz, and Arshard [2023] examined the attitudes of interior architecture students in China toward artificial intelligence technologies using the Technology Acceptance Model (TAM). The research revealed limited awareness of advanced AI tools yet a notable openness to adopting them for enhanced productivity and creativity. The findings emphasize the need for educational institutions to strengthen AI literacy among design students. Similarly, Aboushall [2024] investigated the impact of artificial intelligence on interior design processes and emphasized that while AI cannot fully replace human creativity, it can effectively support design and implementation. The study highlighted the role of machine learning and digital fabrication in enhancing design performance, suggesting that AI should be viewed as a supportive tool rather than a substitute for designers.

Ismail [2024] explored the integration of artificial intelligence technologies into interior architecture education by focusing on applied student experiences. It emphasized the importance of introducing students to AI tools and proposed the creation of structured yet adaptable frameworks to guide AI integration into design studios. In addition, Carroll [2024] examined how generative AI tools—specifically Stable Diffusion—can be integrated into conceptual design processes in interior architecture. The research explored using multimodal inputs, such as physical models and text prompts, to generate design visuals aligned with designers' intentions. The study emphasized the creative potential of using AI in early design phase. It contributes to understanding how AI can augment ideation rather than merely automate routine tasks.

Despite the growing literature on AI integration in architecture, studies on interior architecture education are relatively limited. Considering that interior architecture differs from architecture in its unique components, such as material, color, texture, atmosphere, furniture, and user experience, the pedagogical and methodological effects of using AI should be evaluated separately. In this context, Arisha (2023) emphasizes the transformative potential of AI-driven design tools in interior design education, highlighting how spatial scenarios grounded in art and design culture can be generated through AI programs and integrated into curricular frameworks. The study proposes an interdisciplinary pedagogical model that incorporates coding, prompt-based visual production, and AI-assisted design processes tailored to the specific needs of interior design education. Similarly, Almaz et al. (2024) emphasize that AI contributes to efficiency and sustainability and significantly enhances creativity; their study shows that AI-supported design tools enable students to explore diverse design scenarios rapidly and effectively within an integrated learning environment.

The interaction between AI and space design was addressed in a study by Bayrak [2022], and it was concluded that students generally approached these new production tools positively. However, the study does not include in-depth analyses of how students use AI in the design process, how decision-making mechanisms are shaped, or to what extent design outputs are affected.

The existing literature lacks comprehensive investigations into how interior architecture students engage with concept development processes through the use of artificial intelligence. The impact of AI on design originality and creativity remains controversial, and qualitative observations on how AI transforms the relationship between students and the design process are largely missing from the literature.

Regarding design education, Charles Eames' statement in 1954, "Design will be done with new technological tools in the future and the more prepared the designer is for these tools, the more successful he will be", is still valid today. Technological tools should be considered not only as instrumental but also as a pedagogical element. Currently, technology integration in education is considered not only an instrumental add-on but also a structure that transforms ways of designing.

Especially in disciplines where visuality and representation are prominent, such as interior architecture, AI-based tools offer an experimental environment where students can develop unique design language. However, the way in which this experimental environment is aligned with design pedagogy is still open to research.

3. Methodology

This study was conducted as part of the course "Interior Architecture Project I," offered during the Spring semester of the 2023–2024 academic year in the Department of Interior Architecture and Environmental Design at Istanbul Sabahattin Zaim University. The course aimed to equip students to evaluate context, materials, user needs, and aesthetic decisions holistically when designing a functional interior space. The study involved ten second-year students enrolled in this studio course and voluntarily participated in the research.

The project subject focused on the adaptive reuse of the Kibrithane building, a registered cultural heritage site located in the Küçükçekmece district of Istanbul. Students were tasked with developing an interior design proposal for a restaurant function within a maximum area of 850 m² in the existing structure.

The implementation process was structured around four main stages to systematically examine how students integrated AI-supported tools into their design workflow and how these tools influenced the final outcomes. First, students conducted structural and environmental analyses by researching the historical building and its surroundings, focusing on functional, historical, and spatial context. In the next stage, they generated site-specific concept visuals using AI-assisted tools such as Midjourney, Bing Image Creator and DALL·E, guided by a predefined user profile and functional requirements; the originality and adequacy of the prompts varied across participants. In this work, AI-generated images are not treated as fixed templates or final design proposals but are positioned as inspiration boards, visual trigger stimuli that aim to encourage reflective and creative engagement throughout the design process.

Students developed interior design solutions based on these visuals, including functional layouts, furniture arrangements, and material proposals. Finally, their 3D models were compared with the initial AI-generated visuals through quantitative and qualitative methods, enabling an evaluation of the extent and nature of AI’s influence on the final design outputs.

3.1. Research Process and Stages

The research process was structured in four stages to investigate the influence of artificial intelligence (AI) tools on interior architecture design studio practices. As the first step, students were asked to develop a concept shaped by a user and scenario of their choosing, to be situated within a designated part of the historical Kibrithane Building. Each student prepared stroyboard showing the process of the restaurant with the visuals they created with artificial intelligence using AI tools such as Midjourney and DALL·E. The prompts, written freely by the students, included keywords and spatial descriptions reflecting their design intentions and varied in clarity and detail, allowing for comparative analysis. The AI-generated visuals served as conceptual references, providing initial insights about form, material, atmosphere, and spatial qualities. Although some outputs were unrealistic or functionally inconsistent, they significantly stimulated students' design thinking. The students then developed interior design solutions based on these visuals, producing spatial layouts, functional schemes, material and color strategies, and three-dimensional models with explanatory renderings. In the final stage, the AI-generated concept images and the students’ final 3D

Figure 2: *Comparative student project produced by AI and 3D design programmes*

design outputs were analyzed using qualitative and quantitative methods (Figure 2). This included content analysis and visual similarity assessments based on SSIM, histogram comparison, and Local Phase Descriptor (LPD) analysis. These evaluations provided insights into how AI-supported tools influenced the design process and the specific design criteria—such as form, material, color, and spatial organization—where this impact was most apparent.

3.2. Evaluation Criteria

This study examined the impact of AI-supported tools on the interior architecture design process at both formal and conceptual levels by analyzing students’ project outcomes. Accordingly, the evaluation process was based on four main criteria: form, material, color, and spatial atmosphere. These criteria were selected not only because they represent the fundamental components of interior design but also because they are the primary visual domains most affected by AI-generated outputs.

In particular, formal composition and spatial atmosphere are areas where students express their creativity most clearly. In contrast, AI tools often automatically produce material and color and may appear disconnected from the design context or overly hyper-realistic. Therefore, the comparative analysis based on these four criteria provides a meaningful framework for assessing both the divergences between AI-generated concepts and student interpretations and the extent of the students’ original contributions. These criteria are also widely recognized in the interior architecture literature as fundamental components used in design evaluation and analysis (Ching, 2007; Güngör, 2005; Aydınlı, 1992, 1993).

The criteria were applied as follows:

Form was assessed regarding volumetric coherence, geometric balance, proportion, and spatial organization.

Material was evaluated based on texture, surface quality, and material authenticity.

Color was analyzed through color palette selection, contrast, and tonal harmony.

Space was examined concerning the balance of solid and void, light and shadow effects, spatial openness, and the overall sense of spatial experience.

3.3. Visual Comparison Tools

Within the scope of the study, the AI-generated concept visuals were visually compared with the students' final interior design proposals developed at the end of the semester. Three pixel-based image analysis methods were employed to obtain more objective and measurable data beyond qualitative observations: Structural Similarity Index (SSIM), Histogram Comparison, and Local Phase Descriptor (LPD).

SSIM is an algorithm that measures the structural similarity between two images (Wang et al., 2004). It evaluates parameters such as brightness, contrast, and texture, producing a similarity score between 0 and 1—where 1 indicates perfect similarity and 0 indicates complete dissimilarity. This study normalized both AI-generated visuals and student designs to the exact resolution (256×256 pixels), and an SSIM score was calculated for each paired image set. This method was used primarily to evaluate the form and spatial criteria.

Histogram comparison assesses the distribution of colors in images to evaluate similarity in terms of color harmony and tonal transitions. RGB color space histograms were created for each image and compared accordingly. Since AI-generated visuals often involve hyper-realistic or highly stylized color usage, this method analyzed how students transformed these color suggestions in their design decisions. Histogram comparison served as the primary analysis tool for the color criterion.

LPD is an image comparison method that analyzes edge, texture, and micro-pattern variations (Figure 3). Considering the image's local phase information enables highly accurate texture analysis. It is particularly suitable for examining details related to material and surface quality. This method determined how and to what extent students incorporated and transformed material and texture suggestions from the AI-generated visuals into their designs.

All visual similarity analyses (SSIM, Histogram, and LPD) were conducted using open-source Python libraries with the assistance of ChatGPT, which provided support in coding

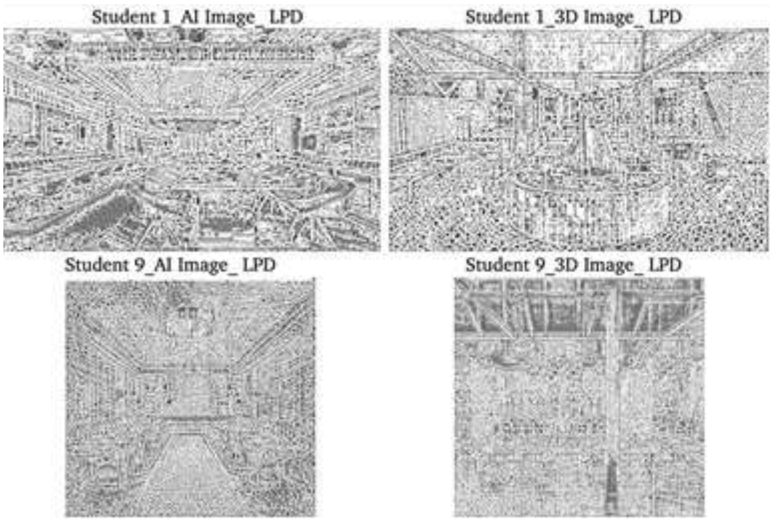

Figure 3: *Local Phase Descriptor (LPD) analysis of Students 1 and 9*

and implementing the comparative analysis methods. This is disclosed in accordance with ethical transparency principles regarding AI-assisted research. In this process, images were resized at the exact resolution, color balances and light intensity levels were equalized, and analysis conditions were standardized. The similarity percentages obtained for each project were transferred to the table, and the total average similarity ratio was determined (Table 1).

The CAIDC (Creativity Assessment in the Interior Design Classroom) framework, which provides a structured rubric for assessing creative performance in design education, was adopted in this study to evaluate the creativity levels of student projects. The rubric includes four main criteria: originality, functionality, aesthetic quality, and design process management, each rated on a 5-point Likert scale (1 = very weak, 5 = very strong). The researcher conducted the evaluation, acted as the studio instructor, and was familiar with the students' design development throughout the semester. Although this introduces the potential for subjective bias, a predefined rubric and consistent scoring protocol were applied to ensure reliability and transparency. The scoring was supported by visual comparisons and reflective documentation provided by the students, allowing for a comprehensive and context-sensitive assessment of creativity in the AI-assisted design process.

In the study, creative impact was not measured directly. Still, it was evaluated through the degree of transformation in sub-criteria such as form, material, color, and space atmosphere, and the capacity to move away from the AI output/reinterpret it. In particular, the students' designs who developed their own contextual decisions instead of adhering to the AI visual received higher scores in terms of creative interpretation. Thus, creativity could be evaluated qualitatively through the transformation skills in the design process instead of a single score.

4. Findings

In this section, the students compare the concept visuals they generated using AI-supported production tools with the 3D design visuals they created at the end of the semester, evaluating them based on four main design criteria: form, material, color, and space. Visual analysis measured each criterion, and pixel-based comparisons calculated percentage similarity ratios.

The AI-generated visual produced by Student 1 at the beginning of the semester was compared with their final 3D design using the Structural Similarity Index (SSIM) method (Fig. 4). The structural similarity was calculated as 8.01%. The student significantly altered the AI output's volumetric arrangement and spatial layout, introducing notable differences in the central table composition, ceiling design, and overall symmetry. This indicates that the AI-generated image was not directly transferred into the final design but reinterpreted through a contextual and simplified design approach.

Figure 4: *Student 1's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Histogram analysis revealed 22.13% similarity. The warm and flashy tones in the AI image were transformed into light and natural material tones in the student's design. This shows that individual and contextual preferences are effective in color decisions. LPD analysis revealed 99.44% similarity. It is understood that the student has largely preserved the surface and material representations suggested by AI. This indicates that the creative intervention is concentrated on the scale of form and space and is limited in the textural dimension. The overall similarity rate was calculated as 43.19% when the three analyses were averaged.

As a result of the SSIM analysis of the AI and 3D works of Student 2, a structural similarity of 12.13% was determined (Figure 5). The student transformed the historical-mystical atmosphere in the AI image into a simpler language that combines local, modern, and traditional motifs in its context. The histogram analysis result is 67.96%. The color palette was reconstructed with a similar temperature balance without being utterly dependent on the AI visual. This points to the student's ability to be inspired by the visual and transform it by their context. The LPD analysis resulted in 99.64% high similarity. Although there are some differences in form and structure, a high level of similarity with the artificial intelligence image was maintained in surface details and aesthetic details. This shows the student adhered to the AI visual in material and texture preferences.

The SSIM analysis of the AI and 3D visuals of Student 3 was calculated as 17.86%, the Histogram analysis as 33.46%, and the LPD analysis as 95.65% (Figure 6). According to these results, the student developed a different design identity based on the atmosphere offered by the AI image rather than imitating it exactly. While the AI visual provides a unique color atmosphere with its open-air effect and natural elements, the student design tends towards a more controlled, closed, and fictional understanding of color within the defined boundaries of the interior space. The surfaces are clear and complete in both the AI and the student visuals, and prominent textures are

Figure 5: *Student 2's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Figure 6: *Student 3's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Figure 7: *Student 4's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

used, especially in the background. Although presenting a different spatial construct, the student uses the surface effect with similar intensity.

When Student 4's AI and 3D works were analyzed using the SSIM method (Figure 7), a structural similarity of 18.93% was found between the two images. The student abandoned the characteristics such as “openness, naturalness, lightness” offered by AI and presented an abstract formal expression and different functional analysis. This shows a creative approach independent of the AI proposal. Histogram analysis of the two images yielded a similarity rate of 48.33%. The AI image is all-natural light and creates a feeling of lightness, while the student design creates a dramatic stage atmosphere with obvious artificial lights and reflective surfaces. The similarity of texture and surface (LPD) was 99.77%. Although the space organization and light are different, the materials' surface effects and textural character are strongly similar.

SSIM analysis of Student 5's images shows a low structural similarity rate of 16.86%. Both images have Japanese/Asian aesthetics (e.g., screens, tea ceremony elements, murals). Still, they are applied in very different ways (Figure 8). The AI design is characterized by warm light and an atmosphere typical of a traditional Japanese interior. In contrast, the student design produces a different perception with daylight from the outside and stagelike tones in the interior. This was supported by the histogram analysis with a rate of 19.18%. The 98.80% high level of similarity obtained from LPD analysis shows that the student design is largely faithful to the AI visual regarding surface and material textures.

Figure 8: *Student 5's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Figure 9: *Student 6's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Student 6 a very low structural similarity rate of 9.05% was obtained between the AI and 3D images (Figure 9). The student has simplified the rich form character of the AI image in a more contemporary language. The Histogram analysis with a rate of 70.23% shows that the color palette of the AI image was largely adhered to. While the AI image is a historical space illuminated with natural light, the student design is designed as a more contemporary interior space. However, the color choices and emphasized materials are similar. Both images feature rich texture combinations that create visual interest. Texture and surface similarity (LPD) was measured as 95.63%. This situation created similar pattern density and transitions in surface analysis.

As a result of the SSIM analysis of the AI and 3D works of Student 7, a low structural similarity of 6.85% was found (Figure 10). The student did not adopt the dense formal language proposed by AI; instead, he constructed the space as simple, casual, and accessible with his design analysis. On the other hand, he achieved a high rate of 60.90% in the Histogram analysis. Although the two images are quite different in form, there is a general harmony between the color spectrum. In the LPD analysis, a very high similarity rate was reached. A 99.57% similarity rate shows that although the volumetric construction of the space is different, it is strongly influenced by the AI visual in terms of the richness of surface details and the way it is organized.

Figure 10: *Student 7's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Figure 11: *Student 8's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

When the AI and 3D works of Student 8 were analyzed with the SSIM method, a structural similarity of 14.21% was found between the two images (Figure 11). The dense texture, symmetrical arrangement, and material diversity in the AI image were solved with minimal, simple, and homogeneous surfaces in the student image. In histogram analysis, the similarity rate was measured as 16.26%. The student has formally interpreted the elements inspired by AI but shows that he has built a very different world regarding color and atmosphere. The LPD analysis rate is relatively high, with 99.77%. A parallelism exists between the linear textures observed, especially on the walls and furniture surfaces, floor coverings, and furniture borders in terms of LPD analysis.

The structural similarity (SSIM) between the Student 9 images is 17.02%. While the student design has a more simplified and modern style, the AI image uses a language of textured walls, ornamented ceilings, and rich details (Figure 12). Histogram correlation was measured at 27.25%. The color difference transformed the aesthetic and perception of the space: The AI image was more luxurious, classical, and theatrical, while the student design produced a more contemporary and casual interpretation. LPD analysis was detected 99.39% of the time. Although the space is more open and linear in the student visual, it is observed that the surface materials are faithful to the AI visual.

Figure 12: *Student 10's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

Figure 13: *Student 9's AI concept drawing (left), final 3D drawing (center) and visual difference analysis (SSIM) (right)*

When we analyzed the AI and final 3D visuals of Student 10 with the structural similarity method, 10.80% similarity was obtained. The student has redesigned the spatial scale, functional organization, and architectural language according to his style (Fig. 13). The histogram analysis result is 25.25%. The change of colors is an essential factor that directly affects user perception. In this context, the student has reinterpreted the AI visual on the axis of functional simplicity. Finally, when we examined the surface and material textures with LPD analysis, 99.61% similarity was found. Although the volumetric and structural constructions differ, the student has developed a close aesthetic understanding of texture arrangements.

In the study, comparative analyses of the artificial intelligence-supported concept visuals of 10 students and their final designs, according to form, material, color, and space criteria,

Table 1: *Similarity ratios between artificial intelligence and 3D design visuals.*

Project number	Form (SSIM)[1]	Material (LPD)	Color (Histogram)	Space (SSIM)	Total Similarity Rate
01	%8.01	%99.44	%22.13	%8.01	**% 34,39**
02	%12.13	%99.64	%67.96	%12.13	**%47,96**
03	%17.86	%95.65	%33.46	%17.86	**%41,20**
04	%18.93	%99.77	%48.33	%18.93	**%46,49**
05	%16.86	%98.80	%19.18	%16.86	**%37,92**
06	%9.05	%95.63	%70.23	%9.05	**%45,99**
07	%6.85	. %99.57	%60.90	%6.85	**%43,54**
08	%14.21	%99.77	%16.26	%14.21	**%36,11**
09	%17.02	%99.39	%27.25	%17.02	**%40,17**
10	%10.80	%99.61	%25.25	%10.80	**%36,61**
Total Average	**%13,17**	**%98,72**	**%39,09**	**%13,17**	**%41,03**

quantitatively revealed the similarity rates of each project (Table 1). The data obtained shows a high material/texture similarity level, averaging 98.72%. This indicates that the artificial intelligence visuals significantly influenced the students regarding material character, surface texture, and aesthetic atmosphere. On the other hand, low similarity rates were found in form (13.17%) and space (13.17%) criteria. This shows that the students developed original design strategies in spatial organization, mass placement, and formal decisions and put forward formal interpretations independent of artificial intelligence. The use of color (39.09%), on the other hand, shows a moderate level of diversity, with some students being more faithful to AI visuals while others adopted completely different color schemes. In total, the average of the four criteria was 41.03%. This rate shows that AI tools do not have a limiting effect on students; on the contrary, they have an inspiring and guiding impact on students and that students maintain their creative interpretation skills.

5. Conclusion and Recommendations

This study has several limitations that should be acknowledged when interpreting the findings. First, the varying levels of students' rendering proficiency and software literacy may have influenced their ability to translate design intentions into digital outputs. As a result, some students may have remained visually closer to the AI-generated concept due to technical constraints rather than intentional design decisions. Second, the time limitations inherent in the academic calendar—especially within a tightly scheduled studio—may have restricted iterative exploration and refinement opportunities. These factors introduce variability that cannot be entirely controlled and may affect the consistency of the comparative analysis. Therefore, the results should be viewed not as definitive measures of creativity or originality but as reflections shaped by a combination of pedagogical experimentation, technological mediation, and practical studio conditions.

This study explored the integration of AI-supported visual generation tools within an interior architecture design studio. It focused on how second-year students utilized these tools during conceptualizing and developing their design projects. Through a structured methodology combining AI-based concept generation, design development, and visual analysis, the study revealed that students actively engaged with AI outputs but did not adopt them directly. Instead, they reinterpreted these visuals by incorporating contextual, functional, and aesthetic judgments, transforming AI suggestions into original, coherent design solutions.

The comparative analysis using SSIM, histogram comparison, and LPD methods demonstrated that the students differed from the AI-generated visuals regarding form, material, color, and spatial atmosphere. These findings highlight the potential of AI as a creative catalyst rather than a deterministic design tool, supporting critical thinking and iterative design development when used reflectively.

- AI tools should be used as supportive instruments that encourage conceptual exploration. These tools can allow students to enhance creative thinking and explore diverse design scenarios.
- Educators should promote a critical and contextual engagement with AI outputs rather than direct implementation. This approach enables students to develop conscious and original design decisions.
- Integrating AI-supported tools in interior design education should go beyond technical proficiency and include aesthetic, cultural, and user-centered evaluations.
- AI tools used in design studios should be structured in a way that guides students, helping them develop skills in prompt writing, interpretation, and synthesis.
- Future studies are encouraged to apply this approach across user profiles, design scales, and AI models. This would allow a broader evaluation of AI's influence on design pedagogy.

Notes: This article based on the paper presented in ICMEK-6 International Congress on Interior Architecture Education, 12-13 December 2024.
Acknowledgment: The author would like to thank the students who participated in the design studio and contributed to the data used in this study.
Conflict of Interest: The author stated that there are no conflicts of interest regarding the publication of this article.
Ethics Committee Approval: This study does not involve any human participants or personal data collection that requires ethics committee approval.
Author Contributions: The author confirms sole responsibility for the following: study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.
Financial Disclosure: The author declared that this study has received no financial support.

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