

Students' Approach to Architectural Design in Developing Urban Areas: A Studio Experience

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Received 23/1/2025 Revised 8/2/2025 Accepted 21/7/2025

Abstract

In the context of urban development, this study looks at how third-year architecture students prioritize and incorporate site-specific elements into their design process. The study, which was carried out in an architectural design studio, focuses on a project in İstanbul's rapidly growing Basak Neighborhood of the Basaksehir District. The Analytic Hierarchy Process (AHP) was used in this mixed-method study to both qualitatively and quantitatively evaluate students' design proposals and their assessment of urban design criteria. The results show that students gave more weight to apparent physical characteristics—especially topography—than to socio-economic considerations like population density. The outcome reveals a weakness in architectural education: instead of using a multifaceted urban analysis, students frequently approach urban development areas from a form-driven perspective. Although they successfully integrate spatial features, their design choices demonstrate little consideration of more comprehensive contextual and policy frameworks. New development areas require integrated design strategies that strike a balance between physical site conditions and socio-economic and infrastructure concerns as metropolitan regions continue to be reshaped by peripheral urban growth. Cities' rapid growth into their outskirts creates problems with accessibility, connectivity, and urban cohesion that call for a more thorough approach to design education. The study also emphasizes the benefits of structured decision-making tools, such as AHP, for teaching students to balance objective spatial analysis with subjective design intuition. Solution-oriented and conjecture-led processes were emphasized over conventional analysis-first frameworks in the design studio, which functioned as a testing ground. The findings imply that incorporating real-world data, participatory techniques, and multi-scalar analysis into design education may improve students' capacity to handle urban complexity. Strengthening partnerships between academia, local governments, and urban planning agencies could enhance students' ability to navigate complex urban dynamics, equipping them more effectively for professional practice in contemporary urban development.

Keywords

Urban development, Architectural design studio, Context-based design, Peripheral urban growth, Multi-Criteria Decision-Making (MCDM).

1. Introduction

The rapid expansion of cities and the formation of new settlements necessitate discussions on urban planning and design in developing areas. According to Fainstein (2000), urban design can be used to assess human quality of life because economic changes, social and demographic shifts, and migration trends all influence urban expansion. In recent decades, sustainability, resilience, and smart design have emerged as major concerns in urban planning, with a focus on walkability, inclusion, and environmental responsibility (Urban Design and Mental Health, 2016).

In parallel, Dogan (2015) characterizes urban space as a multidimensional construct with social, cultural, and psychological components. These characteristics are especially important in urban development zones where spatial transformation is ongoing. A comprehensive urban analysis should address not only the physical environment, but also its functional and social integration. In this perspective, it is critical to evaluate the following key factors when introducing new functions into urban growth zones:

- Demographics and social composition of residents
- Existing land use and zoning regulations
- Environmental factors (pollution, water resources, topography, green areas, etc.)
- Transportation options (public and private accessibility)
- Safety and security concerns
- Socio-economic structure and income levels
- Residents' lifestyles and daily routines
- Deficits in public services and facilities

Urban design faces issues in rapidly increasing metropolitan centers as demographic and economic structures evolve, contributing to decentralization and the formation of new spatial typologies (Wei & Knox, 2015). Their research on urban evolution demonstrates that the mix of social and economic elements in the urban periphery determines how space is arranged, resulting in sprawling city patterns such as “galactic metropolis,” “edge cities,” and “post-suburban developments.”

Istanbul's urban development zones demonstrate the complexities of building livable environments in the face of continuously changing socio-economic and geographical dynamics. In Turkey, urban planning is governed by Zoning Law (No: 3194), which establishes planning regulations at the national, regional, and parcel levels. While macro-scale planning defines broad urban policies, implementation zoning plans give specific limits on building setbacks, height restrictions, and land use allocations. However, in new regions like Basaksehir, the built environment lacks a distinct architectural character, causing urban designs to prioritize parcel-based physical conditions such as street levels for the access to the site or the setbacks above historical or socio-cultural aspects. This tendency is reflected especially in design techniques of mass housing projects, which require students and professionals to navigate a framework formed by both planning limits and changing urban demands.

This study examines the design studio experience of third-year architecture students at Bahcesehir University, Istanbul, who explored the design of a “Lifelong Learning Center” in the Basak Neighborhood, Basaksehir District. The site was selected due to its strategic position on the periphery of the Istanbul Metropolitan Area, where rapid population growth, increasing population density, and evolving social needs create a critical demand for new spatial typologies for the public.

Unlike well-established central districts, Basaksehir represents a dynamic, newly developed zone where urban transformation still is in progress. This setting provides an opportunity for students to analyze how urbanization affects spatial organization and public services while responding to challenges related to infrastructure, accessibility, and environmental sustainability.

Through a structured research and design process, students investigated the site's history, urban growth patterns, and socio-economic context, integrating principles of environmental, social, and economic sustainability into their proposals.

The research primarily looks at how architecture students address urban design challenges in a rapidly developing metropolitan context. The study examines how students prioritize physical and contextual factors in their design processes as well as how the application of the AHP model contributes to structured decision-making in architectural education. The study also seeks to determine whether students' methodologies align with urban design practices and where gaps exist in their analytical approaches.

The study has four overarching objectives:

- to examine how third-year architecture students prioritize urban design criteria such as topography, accessibility, and socio-economic context in their designs and to compare them to urban design practices,
- to assess the efficiency of the AHP model as a pedagogical tool for organizing the design decision-making process in architectural education,
- to examine student design methodologies in comparison with established urban design models and real-life practices,
- to identify gaps in students' understanding of urbanism, including socio-economic and environmental issues, and recommend improvements to architectural education.

2. Architectural Design within Urban Development: Methodologies, Tools, and Decision Criteria

Urban development areas accommodate growing urban populations while causing urban sprawl and the reduction of rural lands. Located on city peripheries, these areas depend on transit infrastructures and function as semi-autonomous zones.

Scholars have approached urban development areas through diverse theories, including satellite cities and polycentrism (Sorensen, 2001; Van Leynseele & Bontje, 2019), edge cities (Medda et al., 1999), edgeless cities (Lang & LeFurgy, 2003), transit-oriented development (Knowles & Ferbrache, 2019), eco-cities (Tang et al., 2022), smart cities (Halegoua, 2020), digital cities (Anthopoulos & Fitsilis, 2010; Ishida et al., 2005), urban sprawl (Brueckner, 2000), and megaregions (Ross, 2012).

Contemporary discourse about urban development increasingly critiques its tendency to exploit rural landscapes without contributing to their socio-economic and spatial integration (Gilbert, 2009). This calls for a reassessment of urban development models through multiple lenses such as economic, social, and environmental. At the macro level, decision-making largely is driven by state policies and local governments, limiting the role of designers in shaping urban growth strategies (Smith, 2010). However, at the meso and micro scales, urban designers play a critical role by applying relevant theories and responding to evolving social, economic, and demographic dynamics. For example, high-rise developments rapidly emerged in Asian urban centers due to population density and socio-economic pressures in the early 21st century (Niu, 2004).

This kind of case demonstrates that the multi-dimensional nature of urban design requires adaptive strategies that respond to contextual factors (Madanipour, 2006).

While modifying a city's physical form is a central focus of urban design, it is not the sole determinant. Urban design extends beyond material and aesthetic concerns, integrating architecture, planning, and landscape design to shape functional and visually cohesive urban environments. These interventions operate across multiple scales, from individual streetscapes and public spaces to district-wide planning strategies.

Architectural design, embedded within urban development, maintains a dynamic dialogue with its context, both responding to existing conditions and shaping emerging patterns. In these areas, urban design functions as a bridge between urban planning and architecture, balancing urban planning's strategic vision with architecture's functional and aesthetic considerations (Erland, 2021). This interaction is evident in decisions such as green space allocation, mobility infrastructure, social interaction zones, safety, transit access, affordability, and environmental sustainability.

Urban design in rapidly developing areas is shaped by a combination of professional methodologies, analytical tools, and strategic decision-making criteria. Designers rely on structured frameworks that integrate quantitative data, spatial analysis, and socio-economic factors to guide their decisions. A range of tools and methodologies are employed to evaluate site conditions and affect urban development strategies. The most widely accepted tools are Geographic Information Systems (GIS), Space Syntax Analysis, Form-Based Codes (FBC), Multi-Criteria Decision Analysis (MCDA), and Participatory Planning.

Several critical factors influence decision-making in urban design. Environmental resilience and climate adaptation are central concerns, as Newman and Jennings (2008) emphasize, while Lehmann (2023) highlights that high-performance urban design optimizes resource efficiency, energy conservation, environmental quality, safety, comfort, health, durability, accessibility, and sustainability. Other factors include transportation and mobility (Banister, 2008; Cervero, 1998), economic viability and land-use efficiency (Talen, 2012), social inclusion and public space integration (Gehl, 2010; Lynch, 1981), and urban morphology and spatial coherence (Alexander et al., 1977; Carmona, 2014b). Caliskan (2012) asserts urban design extends beyond shaping physical form; it involves interpreting and managing spatial systems within a broader socio-spatial framework.

2.1 Urban expansion and population growth in Istanbul's peripheries

Population growth plays a critical role in shaping urban development, influencing spatial organization, infrastructure demands, and socio-economic dynamics. In rapidly expanding metropolitan regions like Istanbul, demographic shifts present both challenges and opportunities for urban planning and design. The continuous population increase in developing zones has generated a growing demand for housing, public services, and transportation networks, necessitating adaptive planning strategies to ensure sustainable urban growth.

Since the early 2000s, Istanbul's macroform has expanded substantially, driven by large-scale infrastructure investments and residential developments. The city's historical east-west linear growth has progressively shifted northward, influenced by superhighways, megaprojects, and migration flows (see Figure 1a-1b). As Long (1985) highlights, each phase of metropolitan expansion is tied to transportation systems, reinforcing the idea that urban macroforms evolve as a fusion of suburban, exurban, and central-city characteristics (Chaves et al., 2011).

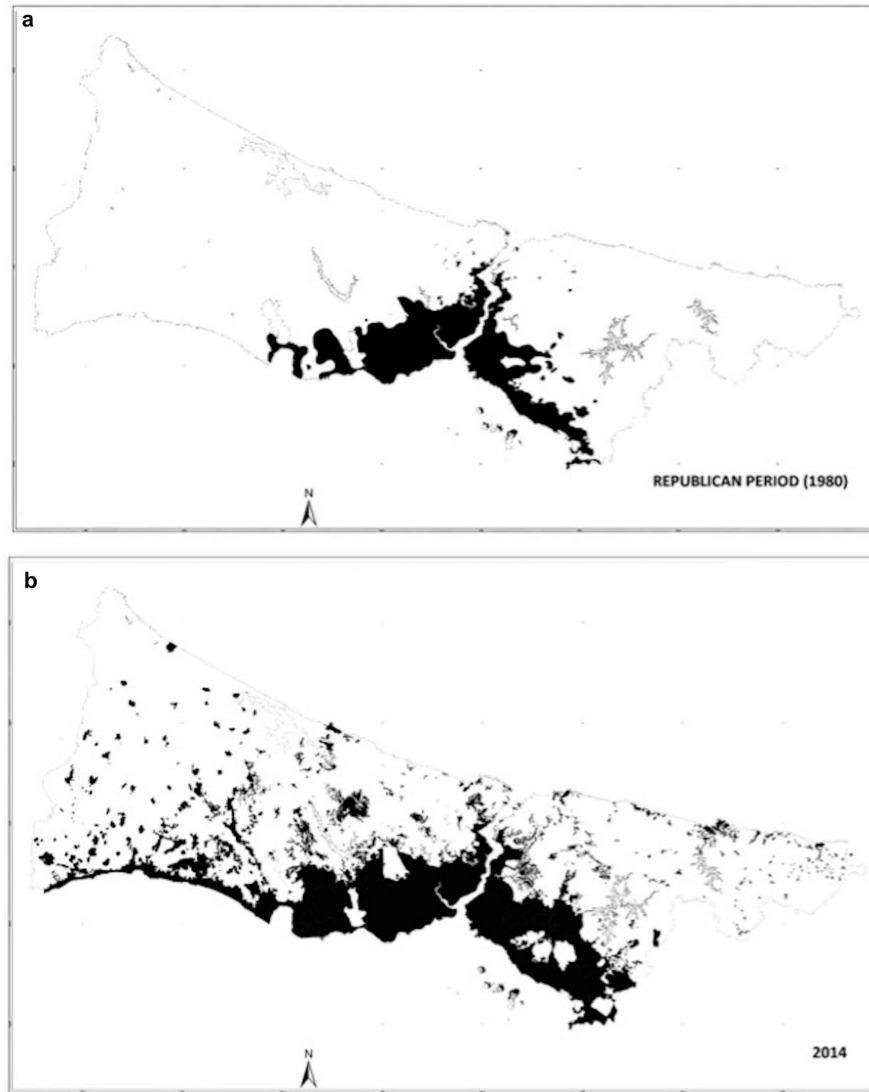


Figure 1a-1b. Spatial development of Istanbul as a metropolitan region, with urban areas shaded in black (Source: Istanbul Metropolitan Municipality, 2014).

Istanbul's sprawling sub-centers are growing without clear boundaries, resulting in an irregular and fragmented urban pattern. This situation aligns with Lang's (2003) notion of "edgeless cities" - urban forms that lack coherent edges due to their dispersed nature. Istanbul's peripheral expansion is characterized by a population shift from older central districts to newly developed peripheries, leading to simultaneous densification and urban sprawl (Sonmez, 2019; Terzi & Bolen, 2011). In particular, the northern part of the city has seen an increase in the number of shopping malls, residential complexes, and business districts along transportation corridors (Yalcintan et al., 2014). Mega projects, such as Istanbul International Airport and the Yavuz Sultan Selim Bridge, have accelerated the creation of new urban nodes, reinforcing Fishman's (1987) concept of "technoburbs" - suburban developments shaped by highway axes.

The demand for secure and enclosed residential environments in Turkey gained prominence in the 1980s (Eren & Dostoglu, 2017), coinciding with the decentralization of urban populations and increased interest in areas such as Basaksehir, Buyukcekmece, Kartal, and Tuzla (Hayır, 2009). As an emerging edge city, Basaksehir has developed along the Bagcılar-Basaksehir corridor, where the urban landscape is characterized by residential blocks and gated communities, largely shaped by highway expansions and proximity to airport infrastructure

(Yalcıntan et al., 2014). According to 2019 data, the three most populous neighborhoods in Basaksehir -Basak, Basaksehir, and Kayabasi- contain 224 gated residential sites, illustrating a trend toward segmented and master-planned housing (Dogan & Ozbayraktar, 2023).

The rapid population increase in Basaksehir and other peripheral districts presents challenges and opportunities for urban design. Gated communities and large-scale residential developments contribute to a fragmented urban fabric, influencing the accessibility of public spaces, infrastructure planning, and overall connectivity. Basaksehir's urban expansion mostly has been influenced by mass housing projects, further reinforcing spatial segregation and car-dependent lifestyles. Metro corridors have attracted residential and commercial investment, supporting transit-oriented development (TOD) (Kam & Ulusay Alpaya, 2023). While increased connectivity offers opportunities for urban growth, it also introduces planning challenges, such as rising infrastructure demands and the need to ensure balanced development between high-density transit hubs and surrounding residential areas.

The study site, Basak Neighborhood (see Figures 2, 3, 4a and 4b), exemplifies the broader spatial patterns observed across Basaksehir, with its car-dependent layout, fragmented urban fabric, and prevalence of gated communities. Especially, intra-urban migration has intensified these dynamics, reinforcing the divide between private enclaves and limited public amenities.



Figure 2. Basak Neighborhood location map (Source: Google Earth web application).

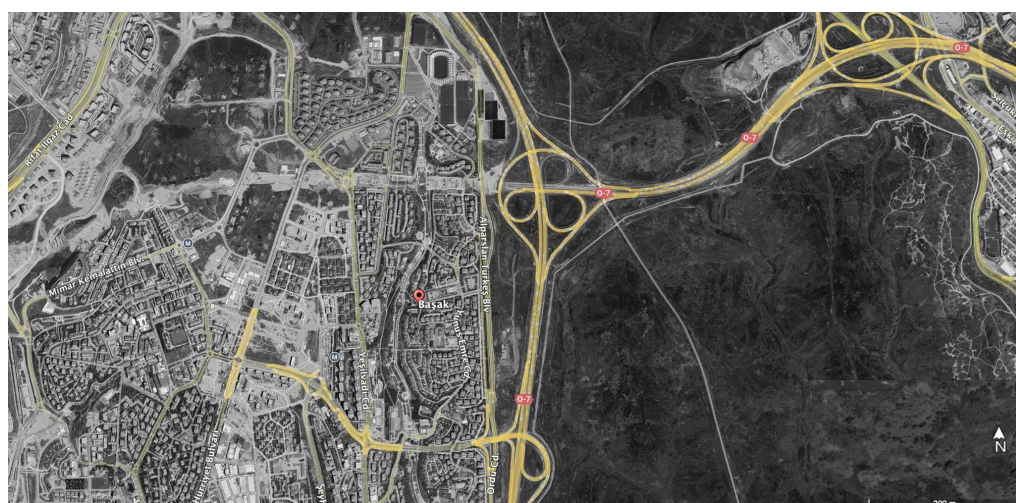


Figure 3. Basak Neighborhood aerial view (Source: Google Earth web application).



Figure 4 a-4 b. A street view from the Basak Neighborhood (left) and gated housing examples (right) (Source: Authors).

The dispersed suburban form of the Basak Neighborhood can be described by what Gospodini (2006) terms “exurban housing dispersal.” Although marketed for their proximity to retail, cultural, and leisure facilities, these developments often are distanced from key urban centers limiting the development of vibrant public life. The dominance of master-planned housing projects reflects a supply-driven logic that frequently overlooks integrated urban design principles. Since the peripheral development does not draw design attention, consequently, urban design interest and architectural discourse remain heavily focused on historical city centers (Charlesworth, 2005).

3. “Urban Development Area” as a Topic for the Architectural Design Studio: A Case Study

Design studios play a pivotal role in architectural education, serving as a platform for students to engage with architectural problems and contexts while integrating technical knowledge, spatial perception, creative skills, and critical thinking. The design studio is considered the core of architectural education, facilitating an experiential learning process through which students explore design methodologies (Ledewitz, 1985; Salama, 1995; Schon, 1987). Researchers in architectural pedagogy have conducted substantial study on studio-based activities that involve design thinking, learning, and teaching.

Pedagogical techniques are applied at different stages of the design process, facilitating structured learning. The constructivist approach positions students as active learners while instructors are “cognitive guides,” preparing design briefs, presenting design challenges, and providing feedback throughout the studio (Mayer, 1999). Kolb’s (1984) experiential learning theory emphasizes how students actively create knowledge through cycles of experience, reflection, conceptualization, and experimentation. This model is supported by Schon’s (1983) idea of the reflective practitioner, which highlights how designers think in practice and continuously respond to complex design situations through a reflective dialogue. Schon (1987) emphasizes the “reflection-in-action” model, advocating for an iterative, and dialogic exchange between students and instructors to reinforce critical thinking and adaptive problem-solving. This approach encourages students to continuously refine their design ideas rather than merely focusing on the outcome.

In line with these theories, Lave and Wenger’s (1991) situated learning framework emphasizes how context and community shape knowledge production, which resonates with the social and spatial aspects that students need to take into account when interacting with actual urban development zones. They argue that

rather than being an educational form, a pedagogical strategy or a teaching technique, learning should be taken as an analytical viewpoint on learning - a way of understanding learning is required. From this angle, the design studio becomes a space where theory and action can be integrated in a situated, real-world context, simulating professional practice while also serving as a venue for critical engagement (Cuff, 1991; Salama, 2015). Salama (1995) relates the problems in architectural production to deficiencies in education. It is emphasized that teaching architectural education suffers from several problems including the gap between education in the design studio and professional practice; the gap between what is thought and what society needs; and the lack of effective teaching methodologies (Salama, 1995).

The design process employed in this case study aligns with the conventional design studio model, in which students improve their projects by critique sessions, arriving at a final proposal. Oxman (1999) points out that traditional design education often mirrors professional practice, with student performance evaluated on the final product instead of the cognitive development taking place during the process. Furthermore, the design studio in this study introduces an experimental approach that gives priority to solution-oriented and contextually engaged processes over conventional analysis-first paradigms. In this sense, it seeks to explore an alternative analytical viewpoint on learning by emphasizing critical reflection, iterative thinking, and responsiveness to real-world challenges.

Designing within urban development zones requires a comprehensive understanding of large-scale urban concerns, the investigation of new community and public space possibilities, and the careful balance between natural and built environments (Chiaradia et al., 2017). These areas, especially in a fast growing city like Istanbul, are very important for both professional practice and architectural education since they offer chances to improve urban quality accomodating diverse activities, services, and public amenities. Therefore, design proposals should reflect the current situation and forecast future urban changes - meeting the changing demands of the region.

The third-year architectural design studio at Bahcesehir University engages students in complex architectural challenges. In this studio, students were tasked with designing lifelong learning facilities in the Basak Neighborhood, Basaksehir District, and were expected to integrate site-specific conditions, sustainability principles, structural logic, and architectural representation techniques (Bahcesehir University, 2025). The selected project site serves as an exemplary case of an edge city in Istanbul. Students worked individually on distinct sites, addressing the district's development potential, socio-spatial dynamics, and emerging technological advancements. The total building area for the project is approximately 2,000 square meters, requiring students to develop comprehensive plans and design.

The selected project sites are well-connected by public transport and characterized by a middle- to upper-middle-class demographic structure. The eight project sites are situated within residential and commercial zones. Zone 1 consists predominantly of gated residential complexes with limited mixed-use development, whereas Zone 2 accommodates a commercial core with educational and religious functions. Zone 1 contains three site options within a residential area, while Zone 2 offers five site options within an active commercial area (see Figure 5). In terms of topographical characteristics, steep topography in Zone 1 was assumed to be a design limitation, whereas in Zone 2, visual relationships with the landscape - particularly in proximity to recreational areas - were thought to have more influence on design decisions.

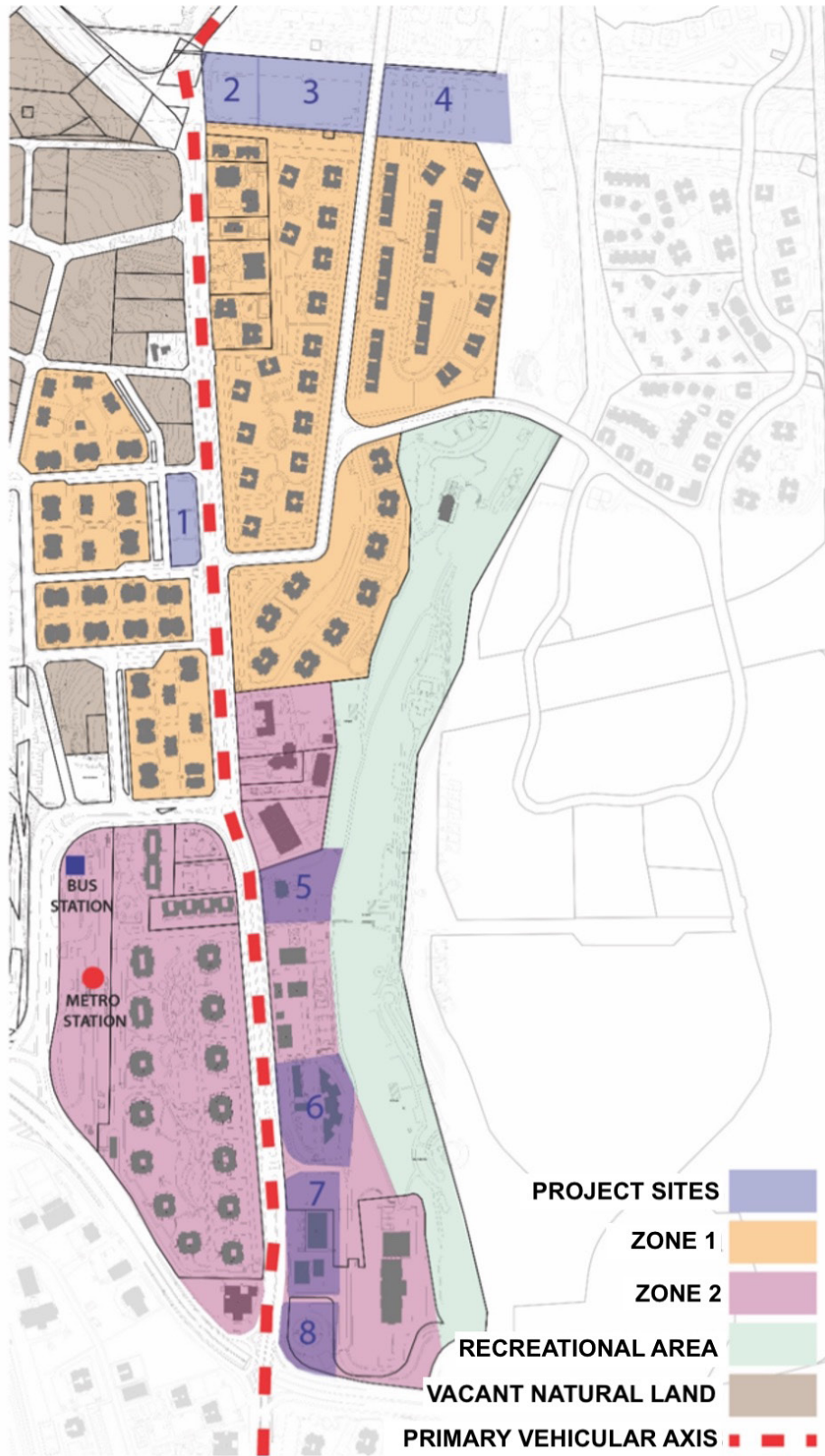


Figure 5. Map of student project area in the Basak Neighborhood.

3.1 Student Approaches to Site-Specific Analysis and Contextual Research

Through contextual mapping, land use analysis, and environmental assessments, students conducted multi-layered evaluations of their project sites. However, their analyses primarily emphasized physical and spatial attributes – such as topography, circulation networks, and zoning regulations – while sociocultural and historical factors remained secondary considerations.

Students were expected to incorporate site analysis as a fundamental component of the design process, building on skills developed in prior studio courses and technical subjects such as Environmental Control Systems. Their research focused on examining the historical evolution of the area, the urban fabric's characteristics, socio-economic dynamics, the built environment, and architectural features. However, the availability of resources for this analysis was largely limited to academic theses, local government reports, and newspaper archives, constraining the depth of contextual insights. Despite these limitations, most students effectively integrated key site analysis components, including solar orientation, shading studies, movement patterns, circulation dynamics, land-use distribution, and the relationship between public and private spaces. Their ability to synthesize these elements into their design proposals demonstrates their growing analytical skills and the iterative learning process fostered within the studio environment.

Students were encouraged to engage with key research questions, given the site's status as a developing urban area:

- Have there been significant physical or architectural transformations in the area?
- How long has the existing urban fabric remained unchanged?
- What is the social and functional significance of these sites for the surrounding community?

To support their analysis, students utilized visual documentation methods, including photography, sketches, and video recordings, which later informed their design perspectives and conceptual renderings. Their research findings served as a foundation for contextualizing architectural interventions within real-world urban conditions. While most students effectively integrated collected data into their design narratives, some struggled to maintain a consistent connection between analytical findings and formal design decisions.

4. Methodology

The research employed a mixed-method approach, including quantitative analysis with the Analytic Hierarchy Process (AHP) and qualitative feedback from instructors, to rank how key environmental factors are used in students' architectural design work. It was conducted as part of standard educational practice. All participants were informed about the research objectives and provided their signed consent.

4.1 Research Design and Data Collection

The study was structured in two main phases:

- Student Feedback via AHP Analysis – The Analytic Hierarchy Process (AHP), a method for making decisions based on multiple criteria, was used to measure how important different design factors were to students at specific sites.
- Instructor Evaluation of Student Projects – Following the AHP analysis, instructors assessed student projects to examine the extent to which the prioritized design factors were effectively integrated into their proposals.

4.2 The Integration of the AHP Model into the Design Studio

In this study, the AHP model was integrated into the design studio as both a pedagogical and analytical tool. The primary objective of using AHP was to provide students with a structured framework to evaluate and prioritize key urban design factors systematically. Unlike traditional qualitative critiques, AHP enabled students to systematically quantify their decision-making processes, fostering a more data-driven approach to spatial planning. By integrating iterative feedback loops into their design development, students were able to continuously refine their strategies, leveraging AHP as a structured framework to balance intuitive design thinking with analytical insights.

The analytical method helped the instructors understand what students cared about most, but the study was limited in some ways. This study does not propose a generalized model but rather presents an analysis of a specific educational experience within a controlled academic framework. The studio was set up as a controlled learning environment, so it did not deal with real-world stakeholders, policy restrictions, or regulatory frameworks. The findings were limited to the context of a design studio setting, where students engaged in guided explorations of urban and architectural design challenges. Also, the sample size was small, and only third-year students were included, so the range of design development that can be shown was limited. These limitations should be kept in mind with respect to making broader generalizations. The key steps in the studio process are outlined as follows:

- “Site analysis and contextual research” on spatial, environmental, and socio-cultural attributes to understand site dynamics, which encompass topography, circulation, land use, and urban identity.
 - “Concept development” responding to contextual constraints and opportunities.
 - Refining proposals through the “iterative design & experimentation” process by studio critiques, comparative analysis, and Schon’s (1983) “reflection-in-action” framework.
 - “Technical and spatial integration” of environmental impact evaluations, functional programming, and zoning regulations.
 - “Final proposal & presentation” of final design submission, where students presented their final design proposal, synthesizing site analysis, contextual evaluations, and AHP findings into a cohesive framework.
- The AHP model served as a key pedagogical tool by providing a structured, data-driven basis for decision-making, ensuring that students’ final proposals were both contextually responsive and analytically justified.

By integrating AHP as a structured decision-making tool, students became aware of the site constraints but also responded to broader urban design principles and contextual complexities. This demonstrates a more evidence-based and reflective design approach, which aligns with the conjecture-led pedagogical approach of the design studio.

AHP is based on pairwise comparisons and utilizes judgment-based numerical ranking (Saaty, 2008). The process begins by establishing a hierarchical structure of design criteria, followed by deriving relative weights for each factor. Participants evaluate each criterion using a 1-to-9 numerical scale (see Figure 6). The method then generates a comparison matrix, automatically applying the reciprocal relationship between paired criteria (Mu & Pereyra-Rojas, 2017). The significance of each criterion is determined through eigenvalue approximation (λ_{max}), and the consistency ratio (CR) is calculated to check if the responses are reliable. A CR below 10% is considered acceptable. CI stands for Consistency Index that measures how consistent the judgments in the comparison matrix (Saaty, 2008).

1	equal importance
3	weak importance
5	moderate importance
7	very strong importance
9	absolute importance
2,4,6,8	intermediate values

Figure 6. The AHP numerical scale range from 1 to 9 developed by Saaty (2008).

The formulas for consistency evaluation are as follows:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad [1]$$

$$CR = CI / RI \quad [2]$$

AHP has been applied widely in urban and architectural studies, particularly for site selection, public service planning, and urban mobility assessments (Flahaut et al., 2002; Sahin et al., 2019; Uzuner & Geyikci, 2021). In design education, AHP is employed to evaluate urban planning and architectural projects by emphasizing group decision-making and comparative analysis of spatial components (Koramaz, 2014). Furthermore, AHP has been suggested as an alternative evaluation method for architectural design studios, offering a structured grading approach that complements traditional techniques (Harputlugil, 2018). In this study, AHP was incorporated not as an assessment tool but as an integral part of the design process to enhance students' ability to reconsider contextual factors during the stage of the design finalization.

By using AHP, as part of their design process, students could identify patterns in their prioritization of site-specific features and critically assess whether their design choices aligned with urban design principles. This structured approach is expected to help them balance subjective design intuition with objective spatial analysis, reinforcing a more evidence-based design process.

From an instructional perspective, AHP served as a data-driven evaluation tool for educators, enabling them to analyze how students perceived and prioritized urban factors. By examining student responses, instructors could identify gaps in contextual understanding, offer targeted feedback, and refine their pedagogical strategies. This integration of AHP into the design studio demonstrates its potential as both a decision-making tool and an educational framework, allowing for qualitative and quantitative assessment methodologies to be effectively combined. Unlike traditional qualitative assessment methods, AHP assigns numerical weights to different factors, enabling an objective comparison. Building upon this structured decision-making framework, the next section details the specific criteria evaluated through the AHP model and their implications in student projects.

4.3 AHP Model and Analysis

Eight criteria were defined by the instructors of the studio as essential contextual factors of an urban area: population demography, access to the site, topography, form, location, natural environmental features, existing built environment, and views from the site to its surroundings. These criteria, coded as X1 to X8, were emphasized by instructors during students' design process. Definition of the contextual factors is as follows:

- Population demography (X1): Refers to the social, educational, and economic status of the neighborhood's residents.
- Access to the site (X2): Indicates the physical connectivity, including vehicular, pedestrian, and public transportation.
- Topography (X3): Represents the site's surface-level changes.
- Form of the site (X4): The geometric shape defined by the site's dimensions and character, whether irregular, regular, uniform, or fragmented.
- Location (X5): The site's relative position, influenced by its proximity to urban cores, structures, or reference spots.
- Natural environmental features (X6): Includes the place's climate, vegetation, and microclimatic characteristics like sun orientation and wind direction.
- Existing built environment (X7): Encompasses the physical attributes of the area, such as land use, building function and style, public spaces, and the built pattern.
- Views from the site to its surroundings (X8): Refer to the visual connections and scenic potential of the immediate environment.

The AHP survey conducted during the 2022–2023 academic term among third-year architectural design studio students involved 35 participants, with 20 meeting the consistency requirements of AHP. The analysis included 10 students from Site Zone 1 and 10 from Site Zone 2. Before filling out the matrix (see Figure 7), students were asked how strongly they applied the site features to their architectural design. The survey used a 1–7 scale. Saaty's (2008) eigenvector method was applied for analysis. The comparison matrix was normalized, the consistency rates for each student were calculated, and 20 matrices were combined using Microsoft Excel, while the overall importance of the criteria was handled by Superdecisions V3.X software.

How strongly more is that the features of urban context is processed in your architectural design process?								
Please write your site choice:								
Please use the given scale below for the factors that effect your architectural design proposal in Başak neighborhood.								
1=equal importance 3=moderate importance 5=strong importance 7=very strong importance								
code & factors	population demography	access to the site	topography	form of the site	location	natural environmental features	existing built environment	views from the site to its surrounding
X1 population demography	1							
X2 access to the site		1						
X3 topography			1					
X4 form of the site				1				
X5 location					1			
X6 natural environmental features						1		
X7 existing built environment							1	
X8 views from the site to its surrounding								1

Figure 7. Matrix template.

The weights were derived from the normalized principal eigenvector of the aggregated comparison matrix. The Consistency Index (CI) and Consistency Ratio (CR) were calculated for each participant to ensure reliability, with only responses meeting the acceptable CR threshold (<0.10) included in the final analysis. The findings of the AHP analysis and the evaluation of the quality of the student projects based on the eight criteria is presented next.

4.4 Findings: AHP Analysis and Evaluation of the Students' Works

4.4.1 AHP Analysis

Regarding all factors, 'Topography' had the highest weight at 0.2228, nearly equal for both site zones (0.2169 for Zone 1 and 0.2229 for Zone 2). This consistency suggests that students generally prioritized topographic conditions in their design decisions. The remaining six factors varied in priority between the zones. In Zone 1, 'Natural Environmental Features' ranked second with a weight of 0.1795, while in Zone 2, it was third at 0.1172. Conversely, 'Views from the Site' ranked higher in Zone 2 (0.1738), similar to the importance assigned to 'Natural Environmental Features' in Zone 1. This distinction may be attributed to the different scenic qualities and natural landscapes in each zone. 'Form of the Site' was ranked third in Zone 1 with a weight of 0.1317, followed by 'Access to the Site' and 'Existing Built Environment.' The least influential factors in Zone 1 were 'Views from the Site' and 'Population Demography' (see Figure 8, 9 and 10).

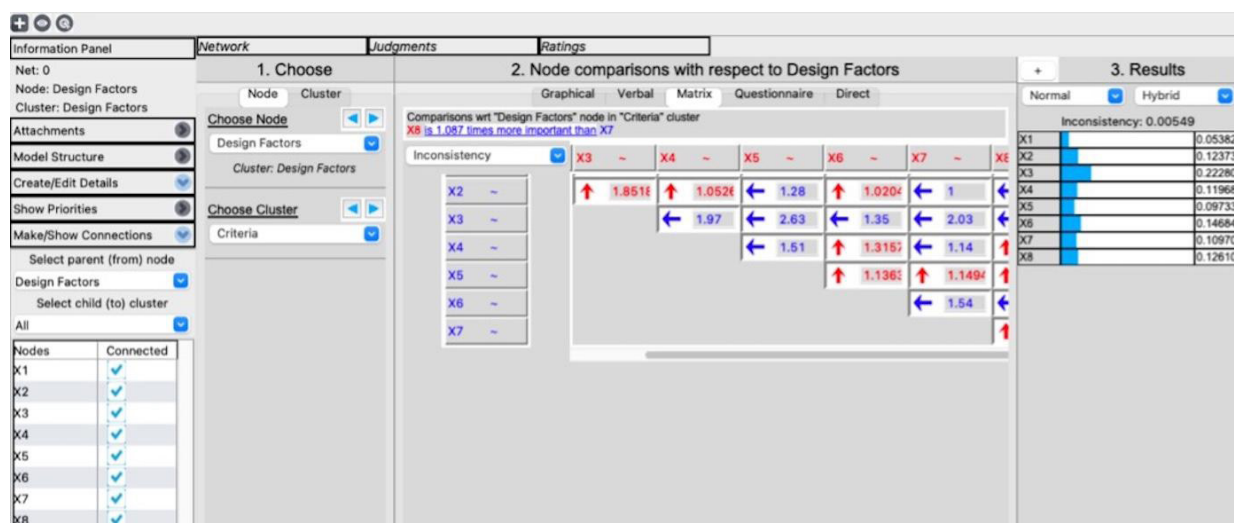


Figure 8. Calculation of the weights for all site zones by SuperDecisions Software.

In Zone 2, the ranking of factors was almost reversed compared to Zone 1, with 'Access to the Site' and 'Natural Environmental Features' receiving similar weights. The strong ranking of 'Topography' and 'Views from the Site' in this zone suggested an interdependent relationship between the site's physical characteristics and visual connectivity. These variations showed how specific site conditions shaped students' prioritization of design factors.

code	factors	SITE ZONE NO.1	SITE ZONE NO.2	ACCUMULATIVE
X1	population demography	0.0466	0.0607	0.0538
X2	access to the site	0.1271	0.1181	0.1237
X3	topography	0.2169	0.2229	0.2228
X4	form of the site	0.1317	0.1069	0.1196
X5	location	0.1012	0.0919	0.0973
X6	natural environmental features	0.1795	0.1172	0.1468
X7	existing built environment	0.1082	0.1082	0.1097
X8	views from the site	0.0884	0.1738	0.1261

Figure 9. Weights of factors for each site zone.

ALL ZONES		SITE ZONE NO.1		SITE ZONE NO.2	
Inconsistency: 0.0054		Inconsistency: 0.0104		Inconsistency: 0.0061	
Design factors (j)	Weights (wj)	Design factors (j)	Weights (wj)	Design factors (j)	Weights (wj)
topography	0.2228	topography	0.2169	topography	0.2229
natural environmental features	0.1468	natural environmental features	0.1795	views from site	0.1738
views from site	0.1261	form of the site	0.1317	access to the site	0.1181
access to the site	0.1237	access to the site	0.1271	natural env.	0.1172
form of the site	0.1196	existing built environment	0.1082	existing built environment	0.1082
existing built environment	0.1468	location	0.1012	form of the site	0.1069
location	0.0973	views from site	0.0884	location	0.0919
population demography	0.0538	population demography	0.0466	population demography	0.0607

Figure 10. Hierarchical order of factors for site zones.

'Location' (X5) was relatively less influential overall (0.0973 cumulative weight). This trend may be explained by the site's peripheral nature and the uniformity of the urban fabric, which may have reduced the significance of locational factors in students' design considerations. Additionally, students may have placed greater emphasis on immediate site conditions rather than macro-scale urban integration.

'Existing Built Environment' (X7) exhibited consistent rankings across both site zones (0.1082 for both). The relatively lower weight assigned to this factor suggested that students did not perceive the architectural fabric as a defining element in their design process. The low score could be attributed to the absence of distinct or character-defining architectural elements, limiting its role as a guiding factor. Instead, students focused on tangible environmental conditions such as topography and accessibility as primary influences in their spatial configurations.

'Views from the Site' (X8) displayed a notable contrast between the two zones (0.0884 in Zone 1 vs. 0.1738 in Zone 2). Students in Zone No. 2 placed greater emphasis on visual connectivity, likely due to its more open spatial configuration and scenic vistas to the neighborhood recreational corridor, which encouraged them to integrate views as a central element in their designs. In contrast, Zone 1's enclosed or obstructed surroundings due to the high-rise blocks likely led students to prioritize functional considerations over visual relationships.

The numerical weighting of design criteria encouraged students to assess their initial design assumptions. When AHP results indicated that students had assigned lower priority to accessibility or placed greater emphasis on topographical constraints, they considered elaborating on their spatial configurations accordingly. This feedback was shared with students during interim design reviews, enabling them to consciously adjust their design strategies. By comparing their intuitive prioritizations with the calculated weights, students could identify mismatches and explore alternative spatial solutions, integrating analytical insights into the

creative process. This iterative feedback process is important to balance creative intuition and data-driven analysis, strengthening an evidence-based design approach.

The findings suggest that students engaged more actively with tangible environmental conditions than with socio-demographic factors. Although the Basak Neighborhood lacks a strong historical identity or distinctive architectural patterns, contextual differences across its various zones still shaped design decisions. The relatively low weight assigned to the 'Existing Built Environment' indicates a preference for analyzing site-specific features such as topography and accessibility over architectural or cultural aspects. Variations in AHP rankings further underline the dominant influence of physical site characteristics in their design process.

4.4.2 Student Design Strategies and site-Specific Applications

The results of the AHP analysis indicated that topography emerged as the primary design factor. In Zone 1, students prioritized "Natural Environmental Features", the "Form of the Site", and "Access to the Site" as key influences on their design decisions. In Zone 2, students identified "Views from the Site", "Access to the Site", and "Natural Environmental Features" as the most significant factors, following topography.

As illustrated in Figure 11 and Figure 12, students' designs reflect the AHP-ranked criteria for each zone - particularly the emphasis on topography, site access, and views. These visual outcomes validate the AHP findings and underscore the influence of physical site conditions in shaping architectural decisions.

Zone 1 Evaluations

Student projects in Zone 1 clearly demonstrated how AHP-ranked factors - particularly *Topography*, *Natural Environmental Features*, *the Form of the Site*, and *Access to the Site* - affected their architectural strategies. These priorities materialized in the following design concepts:

Topography: Students explored *multi-level site accessibility and separation between spaces* by manipulating natural slopes to define circulation and program zones. For instance, they integrated stepped platforms as open-air gathering terraces and slope variations to establish distinct levels of public and semi-private use.

Natural Environmental Features: Projects emphasized *interior and exterior relationships with green spaces* through landscaped courtyards, *integration of natural elements and green pathways*, and preservation of existing vegetation. Some students proposed green buffer zones, while others created transitional outdoor areas that would enhance climatic comfort and spatial continuity.

Form of the Site: The development of massing and layout primarily relied on the three-dimensional articulation of the site form. Students used the *form of the site as a guide for the building form*, aligning structural elements with site contours and creating angular or adaptive geometries that responded to plot edges and views.

Access to the Site: Several proposals demonstrated inner street design as an organizing element for circulation, while others included *welcoming multiple access points* to accommodate diverse user needs. These strategies aimed to enhance inclusivity and reinforce the role of the building as a community-oriented public facility.

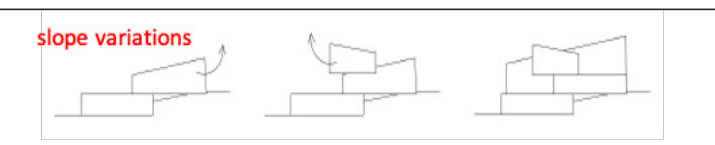
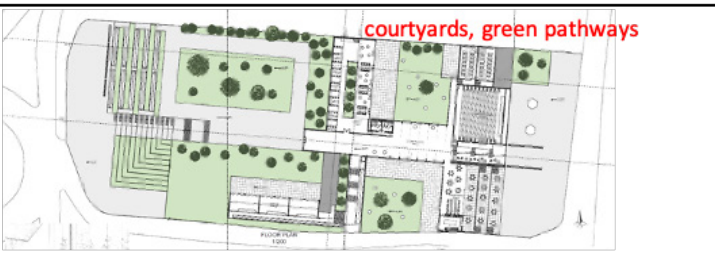
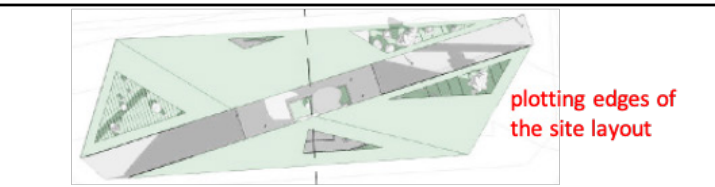
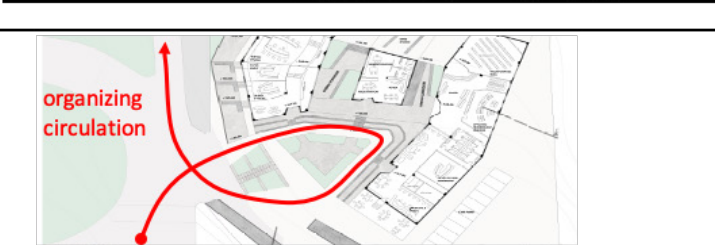
TOPOGRAPHY	MULTI-LEVEL SITE ACCESSIBILITY	 stepped platforms
	SEPERATION OF SPACES	 slope variations
NATURAL ENVIRONMENTAL FEATURES	INTERIOR-EXTERIOR CONNECTION WITH GREEN SPACES	 courtyards, green pathways
	INTEGRATION OF NATURAL ELEMENTS AND GREEN FEATURES	 green buffer zones
FORM OF THE SITE	THREE-DIMENSIONAL ARTICULATION OF SITE FORM	 plotting edges of the site layout
	SITE FORM AS A GUIDING ELEMENT IN BUILDING DESIGN	 massing with the site contours
ACCESS TO THE SITE	DESIGN OF INTERNAL STREETS	 organizing circulation
	DESIGNING MULTIPLE ACCESS POINTS FOR INCLUSIVITY	 multiple access points

Figure 11. Sample works illustrating the effective factors in Zone 1 (Source: Authors).

Student projects showed a clear connection between analytical evaluation and formal expression by the examination of AHP-ranked design priorities. Terms such as “multi-level accessibility,” “green pathways,” and “three-dimensional massing” show how students were trying to use quantitative rankings to make decisions about architecture. However, while the outcome suggested an engagement with structured decision-making tools, the application remained largely focused on physical site attributes. The student work showed a more formal and intuitive way of looking at the rankings, unlike professional urban design practices that use socio-economic data, long-term policy goals, and stakeholder consultation. The study shows that students can spatialize abstract criteria, but they still have trouble putting these into larger urban systems, like demographic trends or infrastructure needs.

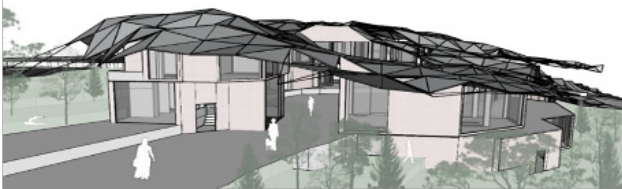
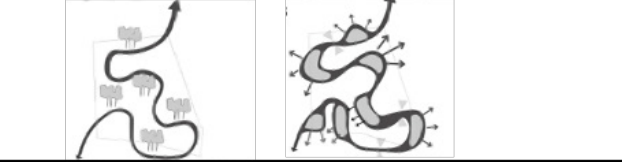
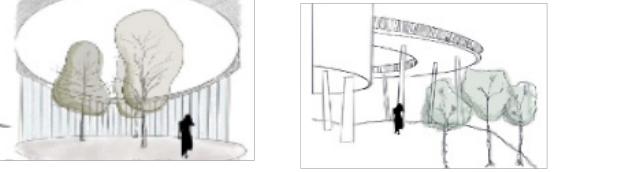
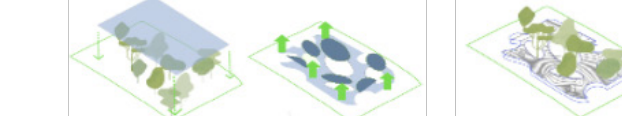
TOPOGRAPHY	LEVEL TRANSITIONS WITH SPATIAL FLUIDITY			
	TERRACE DESIGN FOR CONNECTING BUILDING MASSES	 terraced massing roof forms follow		
VIEWS FROM THE SITE	FRAMING VIEWS TO THE ALLEY THROUGH MASS DIVERSION	 mass division for the view		
	ENHANCING VISUAL CONNECTIVITY THROUGH TRANSPARENCY	 transparency		
ACCESS TO THE SITE	CIRCULAR SPATIAL ORGANIZATION FOR MULTI-POINT ACCESS			
	INTERNAL PATHWAYS TO IMPROVE CIRCULATION			
NATURAL ENVIRONMENTAL FEATURES	INCORPORATING NATURAL ELEMENTS INTO THE BUILT ENVIRONMENT			
	PRESERVATION OF EXISTING TREES			

Figure 12. Sample works illustrating the effective factors in Zone 2 (Source: Authors).

Zone 2 Evaluations

Figure 12 illustrates how student projects in Zone 2 responded to key AHP-ranked priorities: *Topography*, *Views from the Site*, *Access to the Site*, and *Natural Environmental Features*. The following design strategies reflect a clear correlation between these prioritized criteria and architectural decisions:

Topography: Designs reflect *level transitions with spatial fluidity*, using terraced massing to connect distinct building volumes and landscape gradients. Roof forms and circulation axes follow the site slope, embodying an intuitive yet structured response to the terrain.

Views from the Site: Students emphasized *visual connectivity* and *enhanced transparency* by arranging masses to frame *views to the valley through mass division*. They introduced transparent building components such as cantilevered cafés and glazed corridors to capture the scenic quality of adjacent recreational zones.

Access to the Site: Access strategies in this zone employed circular site organization for multi-point access, enabling flexible user movement. Internal pathways were introduced to improve circulation and ensure seamless flow between building components and open spaces.

Natural Environmental Features: Students demonstrated the integration of natural elements into building developments by conserving existing trees and designing around them. Preservation of existing trees and the use of green buffers reflect a commitment to contextual sustainability and ecological sensitivity.

Figure 12 shows how student projects in Zone 2 dealt with the most important AHP-ranked factors: topography, views from the site, access to the site, and natural features. The way these priorities were turned into architectural strategies reflected an effort to connect analytical results with spatial articulation. Students' ability to understand site conditions through intuitive design moves is shown by "terraced massing", "circulation axes shaped by the land", and "cantilevered forms framing views". But these design details mostly focused on the visual and physical aspects of design, and they often did not connect with larger urban systems or social and cultural stories. Professional urban design looks at more than just the visual quality of a design; it also looks at zoning restrictions, how people will use the space, and how the design will affect the environment.

5. Discussion

The findings indicate that students prioritized physical site conditions over complex socio-economic dynamics and we expect this inclination to persist. However, a more integrated approach that combines spatial and contextual analysis could address this gap in design education, as highlighted in this section:

Student approaches and urban design practices

Students' design methodologies were analyzed in relation to urban design models and real-world practices. While professional urban designers adopt a multi-scalar approach that integrates economic, social, and environmental factors, students primarily responded to immediate site conditions. Wei and Knox (2015) describe urban expansion as a process shaped by socio-economic and technological shifts, leading to new urban forms such as edge cities and post-suburban developments. Basaksehir reflects these trends; however, students' site-specific focus demonstrated a limited engagement with broader urban transformations.

In Turkey, urban design guidelines emphasize topography, contextual identity, and multi-layered site analysis as essential factors in urban development. These principles align with broader urban research perspectives. Lehmann (2023) highlights the distinction between "research through urban design," which advances design methodologies, and "research into urban design," which contributes to theoretical discourse. Incorporating these frameworks into architectural education could improve students' contextual awareness and design strategies.

Topography, urban identity and contextual analysis

Students frequently relied on topography as a primary design determinant, shaping spatial composition and circulation patterns. Ministry of Environment, Urbanization and Climate Change (2016) highlight topography’s role in skyline integration, landscape views, and accessibility. Yet, as Garip (2020) argues, contemporary urban design should acknowledge overlapping historical layers and socio-political forces shaping urban transformation. Moreover, students’ site analyses focused on movement patterns and circulation networks, while socio-cultural and historical factors were secondary considerations. This suggests that design studios should incorporate participatory methods and real-world data analysis to enhance students’ engagement with urban complexities (Lehmann, 2023). The Urban Design Guidelines prepared by Ministry of Environment, Urbanization and Climate Change (2016) advocate a multi-layered contextual analysis, including:

- Strategic Context Analysis – Examining the site’s role within urban networks.
- Local Identity and Spatial Continuity – Assessing historical, cultural, and socio-economic factors.
- Environmental Context – Evaluating green spaces, landscape features, and topographical constraints.

Similarly, accessibility received limited attention, primarily focusing on vehicle and pedestrian access instead of holistic urban mobility. In contrast, professional urban designers integrate accessibility within broader mixed-use planning, public transport connectivity, and walkability principles (Urban Design and Mental Health, 2016). This reinforces the need for multi-modal urban mobility frameworks in design education.

Bridging the gap between design education and real-world practice

Unlike professional urban design projects - shaped by regulatory frameworks, policy constraints, and economic imperatives - student-led design remains largely conceptual. Table 1 shows a comparison between student-led and professional urban design practices, highlighting important differences in four areas: design priorities, decision-making tools, stakeholder involvement, and regulatory considerations.

Table 1. Key Distinctions between Student-led Design and Urban Design Practice

Aspect	Student-Led Design	Urban Design Practice
Design Priorities	Conceptual vision, formal composition	Feasibility, sustainability, policy compliance
Decision-Making Tools	Intuitive approach, critique sessions	Data-driven tools (GIS, MCDA, Space Syntax)
Stakeholder Involvement	Limited (academic setting)	Extensive (municipalities, investors, public)
Regulatory Considerations	Minimal	Compliance with zoning laws and infrastructure policies

While students tend to focus on conceptual vision and formal composition within an academic framework, professional urban designers prioritize feasibility, sustainability, and compliance with planning policies. Similarly, students rely on intuitive methods and critique-based feedback, whereas professionals employ data-driven tools such as GIS, MCDA, and Space Syntax. The level of stakeholder engagement also differs significantly; professional practice involves extensive coordination with municipalities, developers, and the public, in contrast to the limited engagement typical in educational settings. Finally, while student projects are not bound by formal regulations, professional urban design must adhere to zoning laws and infrastructure policies, reinforcing the gap between academic exercises and real-world urban planning.

For instance, in a studio setting, students received an extensive information pack, including regional and local policies, land-use regulations, market considerations, and historical and socio-economic data (Chiaradia et al., 2017).

Tarbousha and Gurdallı (2022) argue that integrating digital tools, real-time data, and participatory planning can bridge the gap between academic design exercises and professional urban design challenges. Similarly, Paramita and Yatmo (2020) suggest that experiential learning and environmental analysis should be embedded in the early stages of design education to enhance contextual awareness.

Findings indicate that students have difficulty including important local factors in their design work, supporting Karabey et al.'s (2018) point that understanding the urban environment – like its physical, environmental, and social aspects- should be a main focus rather than an afterthought. While students demonstrated competence in spatial composition, their designs lacked structured engagement with urban regulations, policy frameworks, and socio-economic data. On the other hand, Kamalipour and Peimani (2022) emphasize that urban design education should equip students to address transit-oriented development and sustainability challenges. Expanding pedagogical strategies to include multi-scalar urban analysis, contemporary development trends, stakeholder engagement, and real-time data evaluation could bridge the gap between architectural student projects and professional urban design practice.

Experimentation in design studios and AHP

Experimentation in architectural education is widely recognized (Lawson, 2006; Schon, 1983) as a vital component of iterative learning, reflection, and adaptation (Oxman, 2004). Kolb's (1984) experiential learning theory points to the value of hands-on experimentation, while Cuff (1991) highlights its role in real-world problem-solving, reinforcing its relevance in design education.

In this study, the integration of AHP modeling as an iterative and structured feedback loop enhanced students' ability to elaborate on their designs. As an analytical tool, it allowed students to balance intuitive thinking with data-driven decision-making, helping them adjust spatial configurations when accessibility was undervalued or topographical constraints were overemphasized.

A key limitation of this study is that AHP was applied only in the project finalization stage. While students engaged in site-level evaluations, their multi-dimensional, layered, and multi-scalar thinking remained limited, as expected in early-stage urban design education. In this case, its integration across multiple studio phases and at the early-stage could enhance iterative decision-making and strengthen data-informed urban analysis. Moreover, future applications should consider integrating AHP earlier in the design studio cycle rather than only at the final stage. Earlier use could help students continuously evaluate and adapt their decisions, reinforcing the iterative nature of the design process and improving their ability to align spatial intuition with analytical reasoning.

Future research

While this study focuses on Istanbul, its findings might have broader implications for urban design education in other metropolitan contexts. The emphasis on physical attributes over socio-economic factors is likely a common attitude in early-stage design education, particularly in rapidly urbanizing regions. Future studies should examine how various pedagogical models function at different student levels and in various urban contexts to improve the generalizability of these findings. This will indicate how experience and context affect the incorporation of contextual and physical design considerations.

Expanding the AHP framework to include multiple stakeholder perspectives - such as municipal planners, residents, and developers - could strengthen its applicability as an educational tool. Such an approach would bridge the gap between academic exercises and real-world urban design challenges, better preparing students for professional practice.

Furthermore, future studies could investigate hybrid studio models that combine traditional methods with computational and analytical approaches. Oxman (1999) critiques conventional studios for being product-oriented, assessing only final design proposals rather than incremental cognitive development. As Caliskan (2012) argues, the separation of analysis from design limits research-driven methodologies which can be applied in studio education.

Future adaptations should integrate computational tools, participatory methods, and iterative assessment models to bridge the gap between education and evolving urban design research. Strengthening collaboration between academia and city planning institutions could enhance students' ability to engage with real-world urban complexities and foster data-driven, contextually responsive design approaches.

6. Conclusion

Encouraging students to engage with participatory methods, regulatory frameworks, and socio-economic factors could foster a more holistic design approach. Strengthening collaborations between academic studios and urban planning institutions would enhance students' ability to navigate complex urban transformations as a preparation for professional practice in metropolitan contexts. As a conclusion, these studio practices tend to make graduates who are good at formal and compositional skills but not good at understanding how society works, getting people involved, and dealing with complicated rules. Fixing this imbalance is important for training context-sensitive architects as urban designers who can think critically, be flexible, and understand the context of contemporary urban issues. To close the gap between education and practice, future curriculum changes should focus on giving students access to real-world data, participatory planning, and integrated design-analysis workflows. Especially, in cities that are growing quickly, it is important to collect and analyze real-world data systematically. In historical cities, it is common to have access to large, historical datasets. But in new districts, information often is not consolidated. To keep up with changes in cities, it is important to get data in real-time. Obtaining and analyzing these kinds of data requires more work with city agencies, planners, and local communities, which are interactions that may be outside of the usual scope of architectural education. As these settings change, architects require analytical tools and frameworks that let them look at urban data from the perspective of urban design. These tools should help combine physical, social, economic, and regulatory factors, giving both students and professionals the ability to better understand the complexities of urban development and make better decisions. We can sum up the future directions into two main themes:

Pedagogical Innovations in Studio Education: This includes the “urban data labs,” which can be created with the assistance of data scientists or GIS experts where students learn to interpret urban data. The idea behind “iterative and reflexive design workflows” is to have phased design iterations that include feedback loops for ongoing learning and evaluation. Also, “collaborative studio briefs” could be used to work with municipalities or NGOs to come up with design problems that are relevant to real-world urban issues.

Strategic Engagement with Urban Complexity: This strategy uses “scenario-based urban simulations” that apply tools to mimic changes in demographics, policies, or environmental risks. This approach enables designers to test how well their designs hold up. Additionally, “data interpretation” is about teaching students how to critically analyze urban data to produce useful spatial strategies.

Human Subjects

The research was conducted as part of standard educational practice. All participants were informed about the research objectives and provided their signed consent.

Funding Statement

This research received no external funding.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable written request.

Use of Generative Artificial Intelligence (AI) and AI-Assisted Technologies

Generative AI tools were used during the preparation of this manuscript solely to improve language clarity and readability. The authors reviewed, edited, and verified all content and take full responsibility for the final version of the manuscript.

Author Contributions

Conceptualization, S.S. and S.C.; methodology, S.S. and S.C.; validation, S.S. and S.C., formal analysis, S.S. and S.C.; investigation, S.S. and S.C.; resources, S.S., S.C. and B.A.; data curation, S.S.; writing-original draft, S.S., S.C., B.A., M.V., İ.K. and U.T.; writing-review & editing, S.S., visualization, S.S., S.C. and B.A.; supervision, S.S.; project administration, S.S.; no funding acquisition. All authors have read and agreed to the published version of the manuscript.

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