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Dr. Öğr. Üyesi Turgut Kalay

<https://orcid.org/0000-0002-8532-1203>

Kütahya Dumlupınar Üniversitesi, Mimarlık Fakültesi, Kütahya / TÜRKİYE
ROR Id: <https://ror.org/03jtrja12>

Prof. Dr. Deniz Demirarslan

<https://orcid.org/0000-0002-7817-5893>

Kocaeli Üniversitesi, Mimarlık ve Tasarım Fakültesi, Kocaeli / TÜRKİYE
ROR Id: <https://ror.org/0411seq30>

Evaluation of Studio Classrooms in Interior Architecture Education from an Ergonomic Perspective: A Comparative Study of State and Foundation Universities¹

İç Mimarlık Eğitiminde Stüdyo Dersliklerinin Ergonomik Açından Değerlendirilmesi: Devlet ve Vakıf Üniversitelerinin Karşılaştırmalı İncelemesi

ABSTRACT

Ergonomics is a multidisciplinary field that aims to optimize the relationships among humans, actions, tools, and the built environment by considering physical, cognitive, and sociocultural characteristics. While ergonomic approaches initially focused on production and work environments, they have increasingly become relevant in educational spaces where human interaction, prolonged use, and cognitive performance are central. Within interior architecture education, design studios serve as multifaceted learning environments where production, critique, collaboration, and prolonged spatial engagement coexist. Accordingly, the ergonomic quality of studio classrooms plays a critical role in shaping students' learning experiences, spatial comfort, and professional development. This article evaluates the ergonomic adequacy of interior architecture studio classrooms through the lens of user-function-space relationships. The research is based on field studies conducted in interior architecture departments at two public and two private universities in Türkiye. Design studios were examined with respect to key ergonomic factors, including furniture and equipment, material use, color, lighting, thermal comfort, acoustics, and technological infrastructure. Data were collected through on-site observation, measured drawings, and photographic documentation, while studio-based activities were analyzed in relation to action-oriented spatial use. The findings were comparatively assessed to identify similarities and differences among institutional examples. The results indicate that none of the examined studio environments meet ergonomic criteria in a fully integrated and comprehensive manner. Nevertheless, each university exhibits relatively strong aspects under specific ergonomic categories. The analysis further demonstrates that spatial size alone does not determine ergonomic performance; studios with larger areas may still offer limited ergonomic comfort when furniture layout, seating conditions, acoustic performance, and technical infrastructure are not addressed holistically. Conversely, more compact studio spaces can provide a more balanced ergonomic experience when design decisions are responsive to usage scenarios and user needs. In conclusion, the findings emphasize the need to approach interior architecture studio design through a holistic ergonomic framework that goes beyond quantitative spatial standards. Design studios should be understood not merely as instructional spaces, but as complex learning environments supporting production, interaction, and critical engagement. In this context, ergonomics emerges as a fundamental design tool for enhancing the spatial quality and educational effectiveness of interior architecture studio environments.

Keywords: Interior Architecture Education, Design Studios, Ergonomic Factors, Studio Ergonomics, User-Space Interaction.

ÖZET

Ergonomi, insanın fiziksel, bilişsel ve sosyo-kültürel özelliklerini dikkate alarak insan-eylem-araç-çevre (mekân) arasındaki ilişkiyi düzenlemeyi amaçlayan disiplinlerarası bir alandır. Başlangıçta üretim ve çalışma ortamlarına odaklanan ergonomik yaklaşımlar, günümüzde insan faktörünün belirleyici olduğu eğitim mekânlarının değerlendirilmesinde de önemli bir kuramsal çerçeve sunmaktadır. İç mimarlık eğitimi bağlamında tasarım stüdyoları; uzun süreli kullanım, yoğun etkileşim, üretim ve eleştiri süreçlerini bir arada barındıran çok işlevli öğrenme ortamları olarak öne çıkmakta ve bu özellikleri nedeniyle ergonomik koşullarla doğrudan ilişki kurmaktadır. Stüdyo dersliklerinin fiziksel ve donanımsal nitelikleri, öğrencilerin öğrenme performansı, mekânsal konforu ve mesleki beceri kazanımı üzerinde belirleyici bir rol üstlenmektedir. Bu makalede, iç mimarlık eğitiminin yürütüldüğü stüdyo dersliklerinin ergonomik açıdan ne ölçüde uygun olduğu, kullanıcı-işlev-mekân ilişkisi bağlamında değerlendirilmiştir. Araştırma kapsamında Türkiye'de iç mimarlık eğitimi veren iki devlet ve iki vakıf üniversitesinde yer alan tasarım stüdyoları incelenmiş; mekânlar donatı, malzeme, renk, aydınlatma, iklimlendirme, akustik ve teknoloji başlıkları altında ele alınmıştır.

¹ This article is derived from the master's thesis entitled "İç Mimarlık Eğitiminde Stüdyo Derslikleri ve Ergonomi: Devlet ve Vakıf Üniversiteleri Üzerinden Bir İnceleme" completed.

Çalışmada rölöve alma, fotoğraflandırma ve yerinde gözlem yöntemlerinden yararlanılmış; stüdyo mekânlarında gerçekleştirilen eylemler doğrultusunda kişi başına düşen eylem alanları değerlendirilmiştir. Elde edilen nicel ve nitel veriler, üniversite örnekleri arasında karşılaştırmalı olarak analiz edilmiştir. Bulgular, incelenen stüdyo dersliklerinin hiçbirinde ergonomik faktörlerin tüm bileşenlerinin bütüncül biçimde karşılanmadığını ortaya koymaktadır. Buna karşın her üniversite örneğinde belirli ergonomik başlıklarda görece güçlü yönlerin bulunduğu; ancak bu özelliklerin mekânın genel ergonomik performansını tek başına desteklemekte yetersiz kaldığı görülmektedir. Özellikle kişi başı eylem alanı büyüklüğünün ergonomik uygunluğu tek başına belirlemediği; donatı düzeni, oturma elemanları, akustik koşullar ve teknik altyapı ile ele alınmadığında geniş hacimli stüdyoların dahi ergonomik açıdan sınırlı bir kullanım sunduğu tespit edilmiştir. Sonuç olarak, iç mimarlık stüdyo dersliklerinin tasarımında nicel mekânsal büyüklük kadar, ergonomik faktörlerin bütüncül ve eş zamanlı biçimde ele alınması gerektiği görülmektedir. Tasarım stüdyolarının yalnızca ders anlatımının gerçekleştiği alanlar değil; üretim, etkileşim ve eleştiri süreçlerini destekleyen çok boyutlu öğrenme ortamları olduğu göz önünde bulundurulduğunda, ergonomi odaklı tasarım yaklaşımlarının iç mimarlık eğitim mekânlarının niteliğini artırmada temel bir araç olduğu söylenebilir.

Anahtar Kelimeler: İç Mimarlık Eğitimi, Tasarım Stüdyoları, Ergonomik Faktörler, Stüdyo Ergonomisi, Kullanıcı-Mekân Etkileşimi.

1. INTRODUCTION

Rapid technological advancements, diversification in material production, and increasing interdisciplinary interactions have significantly expanded the scope and fields of application of interior architecture in today's world. Since the late nineteenth century, interior architecture has gradually moved beyond the context of decorative arts and emerged as an independent professional discipline. In this process, it has evolved into a multidimensional design field shaped not only by aesthetic concerns but also by functionality, user requirements, and spatial performance criteria. This transformation has directly influenced interior architecture education, positioning studio-based, practice-oriented education alongside theoretical knowledge transfer as a fundamental component of professional training.

Within interior architecture education, design studios are core learning environments where students develop creative thinking skills, engage in problem-solving processes, and build professional practices through spatial production. Beyond conventional lecture-based classrooms, these spaces function as dynamic educational settings where long-term work, critique sessions, group interaction, and production processes intersect. Accordingly, the physical conditions, spatial organization, and technical characteristics of studio classrooms play a decisive role in shaping the quality and effectiveness of the educational process.

In this context, the concept of ergonomics provides a critical framework for evaluating interior architecture studio classrooms. Ergonomics is an interdisciplinary field that examines the relationship between humans, actions, tools, and the environment (space) by considering physical, psychological, and sociocultural characteristics, and seeks to regulate this relationship in accordance with criteria of efficiency, comfort, and health. In educational environments, ergonomics aims to reduce the physical and cognitive loads encountered during prolonged spatial interaction, enhance learning performance, and ensure spatial comfort. Particularly in interior architecture studios, spaces that require intensive and continuous use, the adequacy of ergonomic conditions plays a determining role in both student performance and instructors' working efficiency.

This study aims to examine the extent to which studio classrooms used in interior architecture education meet ergonomic requirements and to evaluate existing spatial conditions within the framework of user-function-space relationships. For this purpose, two public and two private universities offering interior architecture education in Türkiye were selected as case studies. Studio classrooms and workshops belonging to interior architecture and interior architecture and environmental design departments at these universities were examined with respect to ergonomic factors in space. Within the scope of the study, design studios were evaluated under the headings of furniture, materials, color, lighting, thermal comfort, acoustics, and technology. Spatial data were obtained through measured drawings, photographic documentation, and on-site observations. In addition, activity-based spatial requirements were analyzed by calculating per-capita action areas within studio spaces to assess ergonomic adequacy. The findings aim to identify spatial and ergonomic issues in the design of interior architecture studio classrooms and to contribute to future academic research in this field.

2. THEORETICAL FRAMEWORK

2.1. Studio Education in Interior Architecture

Interior architecture education gained an independent structure within design-based professional fields in the early twentieth century as a result of processes of development and specialization. In this context, it has been stated that the field, initially referred to as interior decoration, began to be defined through the concepts of interior design and interior architecture following conceptual transformations (Çelik, 2008, p. 52). The roots of interior architecture education are grounded in fine arts, home economics, and architecture; therefore, educational curricula are described as interdisciplinary structures reflecting the influences of these fields (Piotrowski, 2001, p. 26).

In the United States, interior architecture education was institutionalized with the establishment of FIDER in 1973, emphasizing the goal of educating creative professionals capable of adapting to evolving professional responsibilities, synthesizing knowledge, and approaching problems from multiple perspectives. This institutional structure was reorganized under the name CIDA in 2006 (Arbay, 2015, p. 16, 36). One of the factors accelerating institutionalization in interior architecture education has been the increase in publications related to interior space design and the growing interest in the profession (Kaptan, 1998, p. 69). In this regard, the first interior architecture education program is reported to have been initiated in 1904 by Frank Alvah Parsons (Bardak, 2007, p. 23). Following World War II, interior architecture education gained a more distinct academic identity within higher education institutions (Kaptan, 1998, p. 69). It is possible to state that the interior architecture education model has developed under the influence of two main approaches. The first is the *École des Beaux-Arts* tradition, which conceptualizes architecture as an art form (Nutter, 2001, p. 26). The second approach, the Bauhaus model, advocates the integration of technical knowledge and practice (Arbay, 2015, p. 12). The Bauhaus model is still regarded as a reference framework for interior architecture education today (Nutter, 2001, p. 35).

In Türkiye, interior architecture education began in 1925 with the establishment of the "Dahili Tezyinat Atölyesi" within the Mekteb-i Sanayi-i Nefise-i Şahane (Fitoz, 2015, p. 4123). It is noted that the concept of tezyinat evolved over time into the contemporary designation of interior architecture (Küçükerman, 1998, p. 7). The Tatbiki Güzel Sanatlar Yüksekokulu, founded in 1955, is reported to have developed a design education approach supported by research and scientific studies (Aslier, 1997, p. 32). From the 1980s onward, increased interest in design, driven by contemporary transformations, technological advancements, and industrial development, contributed to the greater visibility of interior architecture education (Adıgüzel, 2011, p. 37), during which the profession gained prominence (Gül, 2016, p. 11).

Studio courses in interior architecture education serve as primary learning environments where theoretical knowledge and practical application are integrated. Studio education is reported to aim to develop students' fundamental skills, such as perception, inquiry, and conceptual construction (Aydınlı, 1999, p. 62). The studio is defined as an environment where actions of design, production, evaluation, and the development of alternatives are learned and practiced (Gross & Do, 1997, p. 3). Studios are described as the core of formal design education, where learning occurs through experience and practice (Ciravoğlu, 2001, p. 30).

Studio spaces are evaluated as environments that support communication between students and instructors as well as interaction among students; therefore, spatial conditions are considered to play a determining role in the quality of studio education (Dikmen, 2011, p. 1509). The identification of project objectives, instructor feedback, and jury evaluations conducted at the end of the semester are regarded as fundamental components of the studio process (Kurt, 2009, p. 403). In this process, feedback, defined as "critique", is emphasized as one of the essential components of studio education (Kuhn, 2001, p. 351). Within this framework, it becomes evident that studio classrooms should be designed for long-term use and support flexible, collaborative working practices.

Accordingly, studio classrooms in interior architecture education should be addressed not only from a pedagogical perspective but also in terms of their physical and spatial conditions. Given their intensive use, high level of interaction, and diverse range of activities, studio spaces must possess ergonomic qualities capable of supporting students' learning processes. Therefore, the concept of ergonomics provides a fundamental theoretical framework for evaluating interior architecture studio classrooms.

2.2. Ergonomics in Educational Spaces and Studio Classrooms

Ergonomics is defined as an interdisciplinary field that examines the relationships between humans and their environment based on scientific data and aims to regulate these relationships in accordance with principles of health, comfort, safety, and efficiency. According to the International Ergonomics Association (IEA), ergonomics is a scientific discipline that seeks to understand the interactions between humans and system elements and to apply this knowledge to design processes in order to enhance human well-being (IEA, 2011). Hasol (2002, p. 163) defines ergonomics as a field of study concerned with human-task relationships and the design of furnishings and equipment used in work environments in accordance with human physical characteristics. Bayazit (2008, p. 470), on the other hand, conceptualizes ergonomics as the process of scientifically regulating the relationship between humans and their working environments.

Ergonomics is a scientific discipline that aims to ensure harmony between humans, machines, and the environment by considering human anatomical, physiological, and psychological characteristics (Çetin, et al., 2003, p. 1). According to İncir (1986, p. 8), ergonomics seeks to organize environmental conditions by taking into account human biological and psychological characteristics and capacities, while Toka (1978, p. 3) defines ergonomics as an applied science that aims to reconcile environmental systems with human psychophysiological and sociocultural capacities. Dul and Weerdmeester (2001, p. 1) emphasize that ergonomics is not only a scientific discipline but also an area of expertise that directly informs design processes. In Demirarslan's definition (2006, p. 176), ergonomics is described as a research and development tool for identifying the fundamental principles governing the human-action-tool-environment (space) relationship.

Initially focused on industrial production and work environments, ergonomic principles have gradually expanded to encompass educational spaces. Educational environments are spaces in which students and instructors engage in long-term and intensive interactions, where physical and cognitive performance is directly influenced by spatial conditions. For this reason, ergonomics is considered a fundamental evaluation criterion in the planning and design of educational environments. According to Yalçinkaya (2012, p. 787), ergonomics provides a framework that establishes and sustains a healthy relationship between schools, students, and instructors within educational institutions. An ergonomic approach in educational spaces aims to design environments that are compatible with students' physical characteristics, psychological responses, and perceptual capacities. This approach seeks not only to prevent health-related problems but also to enhance the efficiency of the learning process. According to Demirarslan (2006, p. 177-178), the application of ergonomic principles in spatial design encompasses reducing fatigue, mitigating accident risks, and improving comfort and safety. In this context, ergonomics forms the foundation of a human-centered design approach in educational environments.

Studio classrooms used in interior architecture education differ from other educational spaces in that they accommodate multiple types of activities simultaneously. These spaces host various activities such as drawing, model making, prototype production, group work, and critique processes, and they are characterized by long-term use. Therefore, the ergonomic evaluation of interior architecture studio classrooms should be conducted through spatial factors such as furnishings, materials, color, lighting, climate control, acoustics, and technological infrastructure (Demirarslan, 2006, p. 178). It is well established that studio spaces that are not designed in accordance with ergonomic principles negatively affect students' physical health and learning performance.

Within this framework, the concept of ergonomics in educational spaces provides a fundamental theoretical basis for evaluating the spatial quality of interior architecture studio classrooms. Examining the ergonomic conditions of studio classrooms, which directly influence the quality of interior architecture education, is essential both for enhancing the effectiveness of the learning process and for safeguarding user health.

2.3. Ergonomic Factors in Interior Architecture Studio Classrooms

The relationship between ergonomics and space in educational environments requires organizing physical environmental conditions to determine the quality of learning activities through a human-centered approach. In this context, studio classrooms constitute educational settings that require multidimensional ergonomic evaluation due to long working hours, intensive interaction, production processes, and critique activities. Spatial ergonomics in studio classrooms requires the integrated consideration of furnishings, materials, color, lighting, climate control, acoustics, and technology in order to support user health and

learning performance (Figure 1). In this section, these factors are discussed within the context of interior architecture studio classrooms.

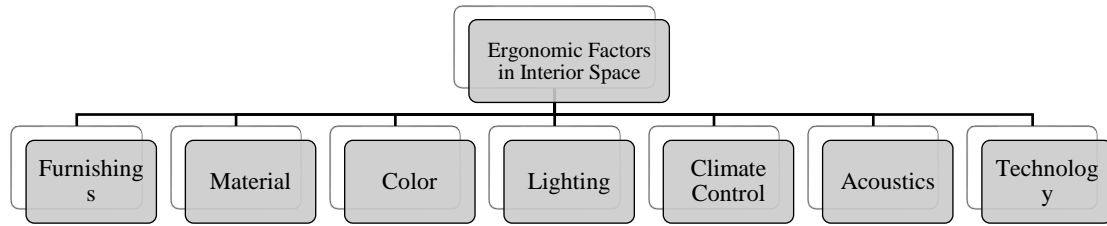


Figure 1. Ergonomic Factors in Interior Space

Furnishings are among the fundamental components of spatial design and are defined as three-dimensional elements designed to meet specific functional requirements (Kaptan, 2001, p. 125). Since furnishings emerge from the dimensional requirements of actions and establish direct visual and tactile relationships with users, they are among the primary elements that determine the quality of human-furniture-space interaction. It is emphasized that fixed or movable furnishings within a space can create sub-spatial configurations through "empty-semi-empty-full" relationships and guide spatial organization (Kaçar, 1997, p. 41). In interior architecture studio classrooms, furnishings include elements such as drawing tables, worktables, seating units, storage units, and presentation boards, all of which directly influence learning and production processes. Therefore, evaluating furnishings in accordance with ergonomic dimensions, functional suitability, flexibility, and comfort criteria is essential for reducing fatigue and posture-related disorders associated with prolonged working periods.

Materials, as fundamental components that enable the formation of a product or spatial arrangement, determine both the physical and perceptual character of space. It is noted that material constitutes the basis of the distinctive texture and form of objects in nature and thus plays a decisive role in spatial formation (Demirarslan, 2006, p. 128). Following the Industrial Revolution, advances in production techniques increased the diversity of materials and introduced new materials into design processes (Göler, 2009, p. 147-148). Studies aimed at improving the chemical and physical properties of materials have supported innovation in the construction sector (Toydemir & Tanaçan, 1997). In educational environments, particularly studio classrooms, material selection should be evaluated in relation to criteria such as durability, ease of maintenance, hygiene, safety, and user comfort. The surface texture of materials, their interaction with light, and their plastic qualities influence spatial perception and increase the designer's responsibility (Demirarslan, 2006, p. 129). Therefore, materials used on surfaces, floors, and work planes in studio classrooms should be selected with intensive use and production activities such as cutting, gluing, and model-making in mind.

Color is defined as the effect created in the eye through the diffusion of light over objects, an effect formed through the eye-light-brain relationship. While light is the source of color, it is emphasized that color cannot be considered solely an objective phenomenon given the nature of visual perception (Erzen, 2008, p. 1308). In design, color is not merely a formal element but also a factor that carries meaning and guides perception. It is stated that color possesses symbolic values and can influence behavior and physiological responses (Mazlum, 2011, p. 128). In this context, color in studio classrooms functions as a design variable that affects attention, motivation, perceptual comfort, and spatial identity. Color decisions should therefore be made by considering user profiles, functional requirements, cultural context, and lighting conditions together.

Lighting is defined as the application of light to enable proper visibility of the environment and its objects (CIE, 2014). It is emphasized that lighting is not limited to providing visibility but also functions as a means of expression in artistic and architectural contexts (Şerefhanoglu Sözen, 2004, p. 91). Hasol (2002, p. 62) defines lighting as the direction of luminous flux onto a surface, while Sirel (2005, p. 1) emphasizes that lighting is a significant phenomenon that requires specific techniques. The objectives of lighting are described as ensuring visibility, achieving a good visual image, and maintaining appropriate visual conditions. In interior architecture studio classrooms, lighting directly affects visually intensive activities such as drawing, model-making, computer-aided design, and presentations. Therefore, a balanced integration of natural and artificial lighting is essential to reduce glare, control shadows, and ensure visual comfort. Natural lighting is considered an integral component of architectural design and is noted for its ability to enhance spatial quality and expression (Özkum, 2011, p. 8). Artificial lighting, on the other hand, provides a controllable solution in cases where natural light is insufficient (Hasol, 2002, p. 62).

Climate control encompasses processes such as heating and cooling indoor air, supplying appropriate air movement, and regulating humidity conditions (Ceylan, 2011, p. 40). Hasol (2002, p. 219) defines climate control as the regulation of indoor air parameters, including temperature, humidity, airflow, cleanliness, and pressure. Appropriate thermal, humidity, and airflow conditions within a space directly affect user health and comfort, and artificial climate control systems can provide suitable comfort conditions when necessary (Kaçar, 1997, p. 40). Within sustainable design approaches that focus on user needs, indoor air ventilation is identified as a critical component (Gür, 2015, p. 50). In studio classrooms, high user density and prolonged use make the continuity of ventilation and thermal comfort particularly critical. Therefore, climate control solutions should be planned with user density and activity types in mind.

In the context of acoustics, auditory perception involves processes that stimulate the ear and vary depending on the characteristics of the medium through which sound is transmitted (Akdağ Yüğrük, 2000, p. 193). It is noted that sound reflects off interior surfaces and provides cues related to spatial perception (Demirarslan, 2006, p. 168). Acoustics is defined as the scientific field that examines the physical properties of sound in a space, its interaction with the environment, and related practical issues (Demirarslan, 2006, p. 168). Hasol (2002, p. 34) describes acoustics as the quality of a place in terms of sound perception, while architectural acoustics emphasizes the transmission of desired sounds without distortion. A distinction is made between building acoustics (noise control) and room acoustics (Sirel, 1974). Auditory comfort and noise control are emphasized as important design parameters. Due to group work, critique sessions, and collaborative production processes in studio classrooms, acoustic regulation is essential for communication quality and sustained attention. Selecting appropriate materials and surfaces to balance sound absorption and reflection, as well as installing sound systems when necessary, contribute to achieving auditory comfort (Demirarslan, 2016, p. 30).

Technology is defined as the set of tools developed by humans to control and transform their material environment, along with the knowledge related to these tools (Demir & Acar, 1997, p. 219). Technology has been described in various ways, including the application of verified knowledge to achieve specific goals (Demirel, 1993, p. 91), the creation of functional structures through the utilization of acquired skills (Alkan, 1998, p. 13), and a discipline developed to gain mastery over nature through the application of science (Simon, 1983, p. 173). Hasol (2002, p. 451) addresses technology within the context of building technology and technical terminology. It is stated that technology gained momentum particularly after the Industrial Revolution and continues to exert influence on spatial design today (Acarkan, 2004, p. 17). In interior architecture studio classrooms, technology constitutes a fundamental component of computer-aided design, digital production, presentation, and research processes. The selection and placement of technological tools and equipment in accordance with user needs are considered factors that determine the qualitative characteristics of space (Özturan, 2010, p. 127).

The ergonomic factors discussed in this section provide a theoretical framework for evaluating the spatial quality of interior architecture studio classrooms. Addressed under the headings of furnishings, materials, color, lighting, climate control, acoustics, and technology, these factors enable a holistic evaluation of studio spaces within the context of user-function-space relationships.

3. METHODOLOGY

This study was designed as a field-based, qualitatively oriented research aimed at evaluating the ergonomic adequacy of studio classrooms used in interior architecture education. Ergonomics, which initially focused on industrial production environments, has expanded its scope over time to include educational spaces as a significant area of application. Particularly in higher education institutions, where intensive interaction between students and instructors takes place, the need to assess spatial conditions in accordance with ergonomic criteria has become increasingly prominent. Within this framework, the present study examines interior architecture studio classrooms through the lens of educational space ergonomics in higher education.

As part of the research, fieldwork was conducted, and the sample comprised two public and two foundation universities in Türkiye that offer interior architecture education. Among the public universities, Eskişehir Technical University and Kocaeli University were selected due to their established history in interior architecture education, as well as the distinct spatial challenges they present in terms of physical facilities. The Interior Architecture Department of Kocaeli University operates within a limited campus area in a building shared with other departments, while the Interior Architecture Department of Eskişehir Technical University has undergone changes in its physical conditions following its separation from Anadolu University and relocation to a new campus. These differing spatial contexts were decisive factors in the

selection of the two public universities. Among foundation universities, Maltepe University, established by the İstanbul Marmara Education Foundation (İMEV), and TOBB University of Economics and Technology, founded by the Union of Chambers and Commodity Exchanges of Türkiye Education and Culture Foundation (TOBEV), were selected. The strong physical infrastructure investments of these institutions in interior architecture education and the relatively accessible institutional cooperation during the research process played a significant role in their inclusion in the study (Kalay, 2019, p. 1).

The research area consists of design studios and workshops located within the interior architecture and interior architecture and environmental design departments of the selected universities. These spaces are intensively used by interior architecture students throughout their educational processes for a wide range of activities, including drawing and model-making, critique sessions, group work, and theoretical instruction. The spatial dimensions and volumes required for these activities vary depending on student numbers, working modes, and usage scenarios. Therefore, within the scope of the study, action areas per user were calculated on a square-meter basis in accordance with the activities carried out in studio spaces, and spatial adequacy was analyzed accordingly.

The data collection process was carried out using on-site observation, measured drawings (surveying), and photographic documentation. Necessary institutional permissions were obtained at the selected universities, and interviews were conducted with department heads and vice heads. Field studies conducted in the studio classrooms and workshops of each university lasted approximately four to six hours on average. During this process, spatial measurements were taken, furniture layouts were documented, and user activities were systematically observed.

The collected data were analyzed based on criteria that allow for ergonomic evaluation in interior architecture studio classrooms. Within this scope, the spaces were examined under the headings of furnishings, materials, color, lighting, climate control, acoustics, and technology, within the framework of user-function-space relationships. In addition, supporting infrastructure elements, such as electrical and water installations, storage areas, and internet access required in studios and workshops, were included in the evaluation. As a result of these analyses and comparisons, the ergonomic adequacy of studio classrooms across different universities was identified, and spatial usage conditions were addressed through a holistic approach.

4. FINDINGS

This section presents the ergonomic adequacy of studio classrooms and workshops used in interior architecture education based on the university cases examined within the scope of the field study. The findings are derived from spatial data obtained through measured drawings, photographic documentation, and on-site observations, as well as from per-user action-area measurements calculated based on the activities carried out within the studios. During the evaluation process, studio classrooms and workshops were examined within the framework of ergonomic factors, including furnishings, materials, color, lighting, climate control, acoustics, and technology. The study encompasses interior architecture studio classrooms located in two public universities (Eskişehir Technical University and Kocaeli University) and two foundation universities (Maltepe University and TOBB University of Economics and Technology). Each case was analyzed in terms of its spatial characteristics, action area measurements, and ergonomic factors.

The Interior Architecture Department of the Faculty of Architecture and Design at Eskişehir Technical University is located in a building shared with the Faculty of Engineering and includes four design studios. These spaces, which were previously used as two classrooms, were divided into four studios in response to increasing user demand, each with an approximate usable area of 150 m². The studios serve as multipurpose educational spaces for basic design education, drawing, model-making, and professional courses. Within the design studios, three different types of tables are used, measuring 75x105 cm, 110x160 cm, and 160x160 cm. Among these, the 75x105 cm tables are the most commonly used and preferred for drawing activities, theoretical courses, model-making, and single-student critique sessions. The larger 110x160 cm and 160x160 cm tables are used for critique sessions involving multiple students and for group work.

Based on the measurements, the per-user action area provided for drawing activities and theoretical courses on the 75x105 cm tables was determined to be 1.5 m². These tables are arranged in combined configurations within the space, creating two circulation corridors. For critique sessions involving a single student and an instructor, the action area was measured as 1.9 m². During model-making activities, students

were observed to require a larger movement area around the table; when movement zones were included, the action area was calculated as 4.3 m². The use of tables in combined configurations, while allowing separation when needed, enables the provision of this movement area (Figure 2).

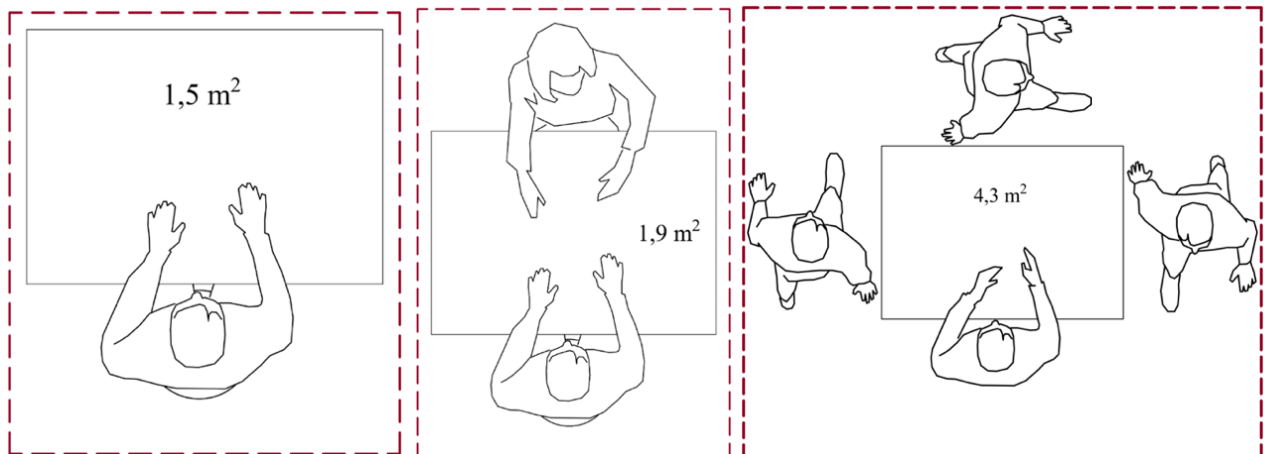


Figure 2. Per Capita Activity Area

For the 110x160 cm tables used in multi-student critiques and group work, the defined action area was 5.4 m². These table types can accommodate up to four students for critique sessions and up to six for group work; in some cases, they are combined in studio and corridor areas to serve larger numbers of users. The 160x160 cm tables were used for critique sessions involving up to six students and for group work with up to eight students, with a calculated action area of 6.7 m² for this table type (Figure 3).

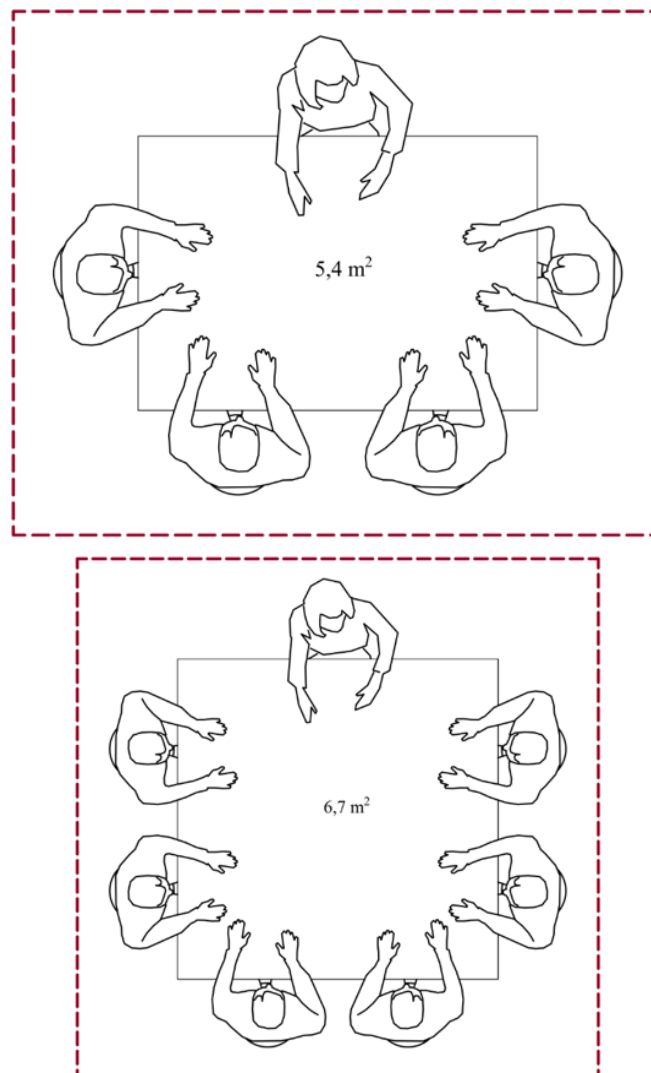


Figure 3. Group Work Activity Area

The design studios were evaluated in terms of ergonomic factors, including furnishings, materials, lighting, acoustics, and technological infrastructure. It was observed that the studio classrooms contain drawing tables, stools, display boards, hanging systems, whiteboards, a projection device, a computer, light tables, an instructor's podium, and a sink. The studios feature a combined layout created by grouping different table types. However, due to the high number of students, the spaces are organized as large-volume areas, which weakens their character as design studios and brings them closer to conventional classroom use.

The lack of angle-adjustable worktables limits the ergonomic use of technical drawing tools, such as T-squares and set squares, in drawing-intensive courses (Figure 4a). Seating elements predominantly consist of stools without back support. Although these stools are height-adjustable, their lack of back support was observed to create ergonomic issues that may lead to discomfort in the head, neck, and back during prolonged, intensive studio work (Figure 4b). Due to the high student population, some worktables and stools were relocated to studio corridors, which subsequently became temporary spaces for practical work, critique sessions, and group activities (Figure 4c).

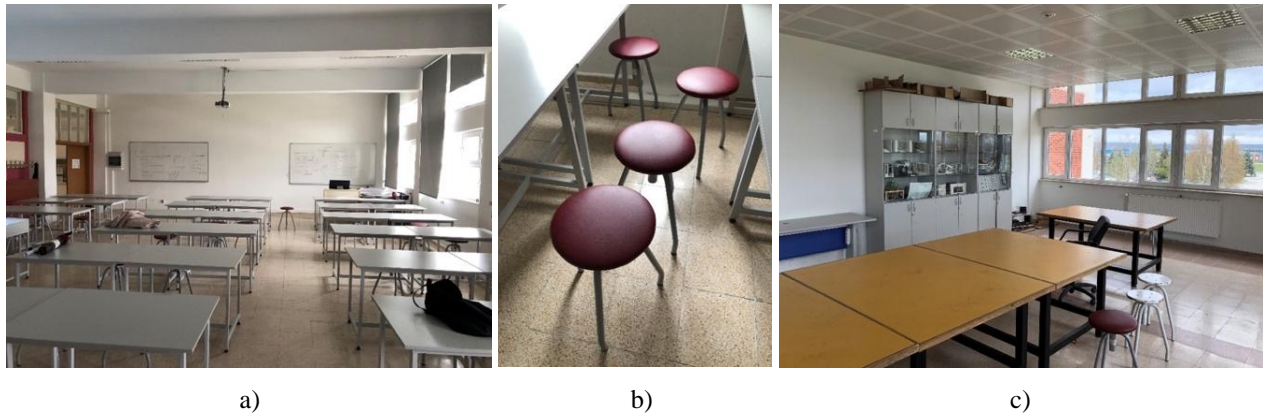


Figure 4. a) General View of the Studio, b) Seating Elements, c) Temporary Use Areas

In terms of materials, the studios are located within a reinforced concrete structure, with mosaic tile flooring and painted plaster surfaces for partition walls. The worktables feature white and yellow laminated chipboard surfaces, metal structural components, and electrostatically painted legs. Seating elements consist mainly of stools with metal legs and MDF seating surfaces; in some cases, foam and synthetic leather upholstery are used. While these materials are durable, they offer limited comfort and long-term ergonomic performance.

It was determined that the studios lack sufficient storage areas for model-making activities, with only a single model storage unit located in a studio corridor (Figure 5a). Due to the insufficiency of this unit, models were observed to be stored in general storage areas used for preserving student work (Figure 5b). Additionally, the number of personal storage units positioned in the corridors was found to be insufficient to serve all students (Figure 5c). Furthermore, the fact that water installations required for basic design education are present in only one studio indicates that this facility is inadequate in meeting user needs.



Figure 5. a) Model Storage Unit, b) Storage Area, c) Personal Storage Units

Regarding color usage, burgundy applications were observed on some wall surfaces, with the same color reflected in seating elements to establish visual unity within the space (Figure 6a). However, color usage appears to serve more as a limited surface intervention than as a comprehensive design decision that supports perceptual comfort and work motivation. Lighting conditions are provided through a combination of natural and artificial lighting sources. Artificial lighting is provided by white fluorescent luminaires,

while natural lighting is supplied through windows on a single façade (Figure 6b). These windows also contribute to ventilation, while heating is provided via radiators connected to a central heating system. Nevertheless, it was observed that natural light entering through a single façade does not evenly distribute throughout the space, resulting in limited visual comfort in certain work areas.



Figure 6. a) Studio Color Scheme, b) Lighting Conditions

From an acoustic perspective, the absence of sound-absorbing or sound-reflective surfaces in large-volume studios was found to prevent adequate auditory comfort. This condition leads to increased noise levels during group work and critique sessions, negatively affecting communication between instructors and students.

In terms of technological infrastructure, it was observed that studios are equipped with a computer connected to a projection device, which is used by instructors. No shared computers are provided for student use, and internet access is obtained through personal devices. Additionally, due to the inadequacy of the existing electrical infrastructure, temporary solutions using extension cords are employed. This situation not only creates visual clutter within the space but also poses potential safety risks.

The Department of Interior Architecture at the Faculty of Architecture and Design of Kocaeli University conducts interior architecture education through design studios, seminar classrooms, and workshop spaces configured at different scales. Within the department, there are seven design studios used for drawing activities, theoretical courses, and model-making, with action areas ranging from 80 m² to 157 m². In addition, there are classrooms with an area of 52 m² used for both theoretical courses and workshop activities, as well as seminar rooms utilized for group work, collective critique sessions, and large-scale model production. Furthermore, a 211 m² design workshop, located in a separate educational building and used primarily for basic design and furniture education, is actively utilized by the department. These studio and workshop spaces are shared with the architecture department.

In the design studios, classroom-style tables measuring 60 x 80 cm are predominantly used. This table type functions as the primary work surface for individual drawing activities, theoretical courses, model-making applications, and critique sessions involving a single student. In addition, seminar classrooms include larger tables measuring 110 x 250 cm, used for critique sessions involving multiple students, group work, and large-scale model production. Based on the measurements, the per-user action area provided for drawing activities and theoretical courses using the 60x80 cm tables was determined to be 1.0 m². These tables are arranged in paired and single configurations, particularly in large-volume studios, and organized within the space to create three circulation corridors. The action area allocated for critique sessions and brief instructional guidance involving a single student was calculated as 1.3 m². During model-making activities, students were observed to require a wider movement area around the tables; accordingly, the combined movement and action area defined around the 60x80 cm tables was determined to be 3.6 m². In cases where existing table dimensions were insufficient for large-scale model work and group applications, tables were combined for use, a practice observed particularly in spaces designated as seminar classrooms (Figure 7).

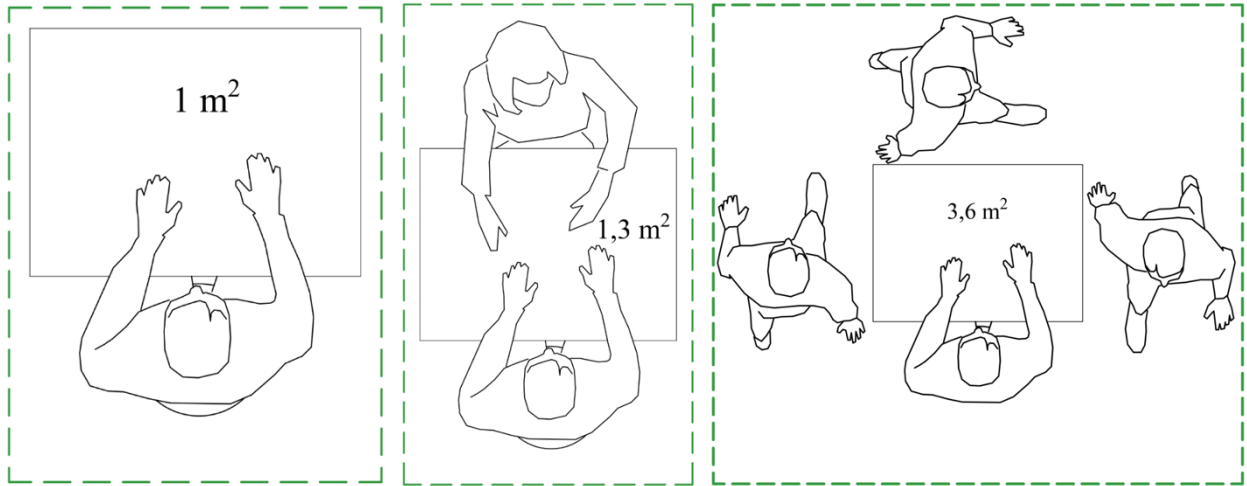


Figure 7. Per Capita Activity Area

For the 110x250 cm tables used in critique sessions involving multiple students, group work, and large-scale model applications, the defined action area was calculated as 7.3 m². This table type is primarily located in seminar classrooms and serves collective production and evaluation processes (Figure 8).

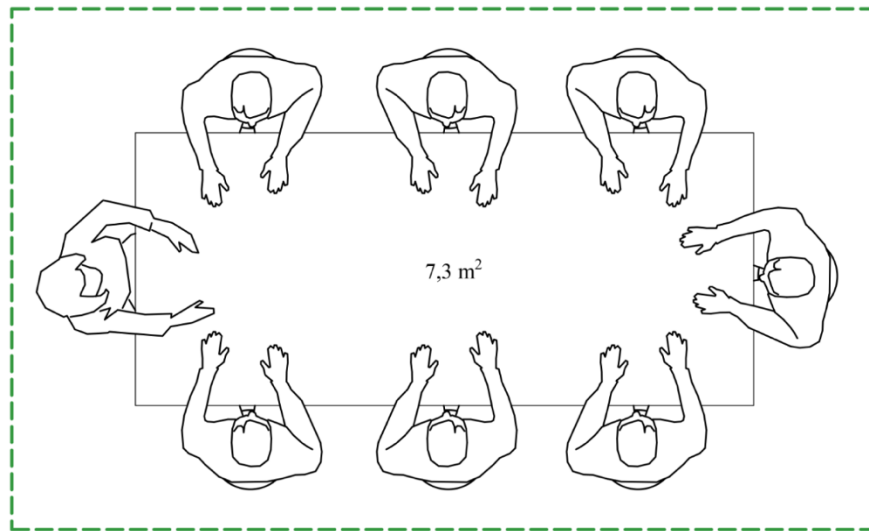


Figure 8. Action Area for Group Work and Large-Scale Model Making

Based on these spatial and quantitative data, the design studios and workshops of the Department of Interior Architecture at Kocaeli University were evaluated ergonomically in terms of spatial organization and furnishing characteristics. The findings indicate that the compatibility between educational spaces and user requirements remains limited. Due to the high number of students, the workshops are designed as large-volume spaces, which moves them away from the character of design studios and toward conventional classroom use. The 60x80 cm classroom tables commonly used in studio classrooms were found to be insufficient for application-oriented interior architecture courses; therefore, tables were frequently combined into groups of six or eight users. While this configuration allows flexible use, it restricts individual working comfort and personal action areas. Moreover, the absence of angle-adjustable drawing tables complicates the ergonomic use of technical drawing tools such as T-squares and set squares, leading students to adopt improper postures and work under ergonomically unfavorable conditions during prolonged activities.

It was observed that the studio classrooms contain classroom tables, chairs, wall panels, modular hanging systems for displaying and storing student work, whiteboards, projection devices, and instructor desks. The furnishing elements do not follow a fixed layout within the workshop spaces; rather, the positioning of tables varies depending on circulation zones and usage scenarios, as tables are combined or separated as needed (Figure 9a).

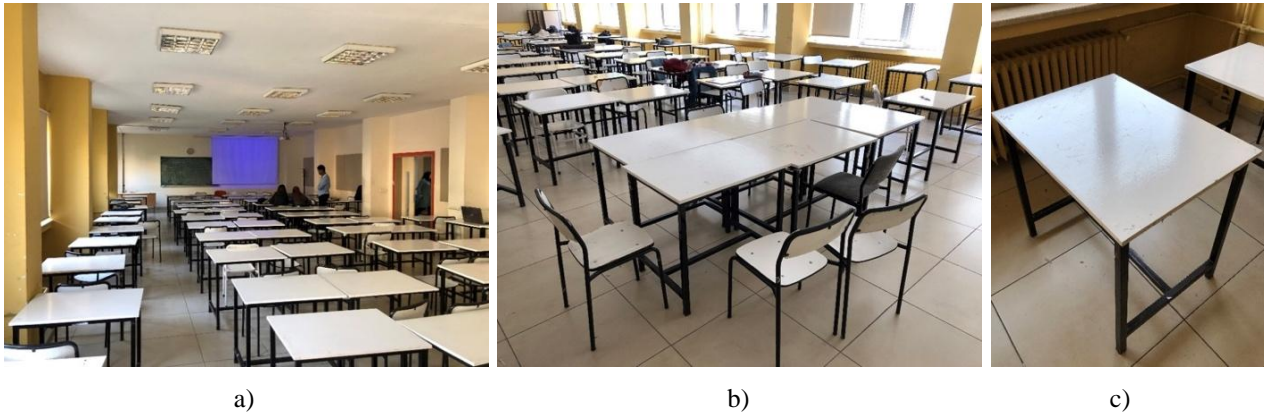


Figure 9. a) General View of the Studio, b) Combined Worktables, c) Drawing Tables

As shown in Figure 9b, the small-scale classroom tables were found to be inadequate for application-oriented courses, leading to their use in combined configurations accommodating six to eight users. Although this arrangement supports flexible use, it limits individual working comfort and personal action areas. Additionally, the lack of angle adjustability in drawing tables further complicates the use of technical drawing tools and results in ergonomically unfavorable postures during long-term work (Figure 9c).

Seating elements primarily consist of chair-type seating with back support. While these chairs provide limited support for the head, neck, and back during short-term use, they were observed to be ergonomically insufficient for prolonged studio activities. Furthermore, surface deformations were identified in a significant portion of the seating elements examined (Figure 10a). In addition to the main workshops, the department also uses a 211 m² design workshop in a different building on the same campus, primarily for basic design and furniture education. This workshop was observed to differ from other studios in its use of color, seating elements, table arrangements, and structural characteristics (Figure 10b).

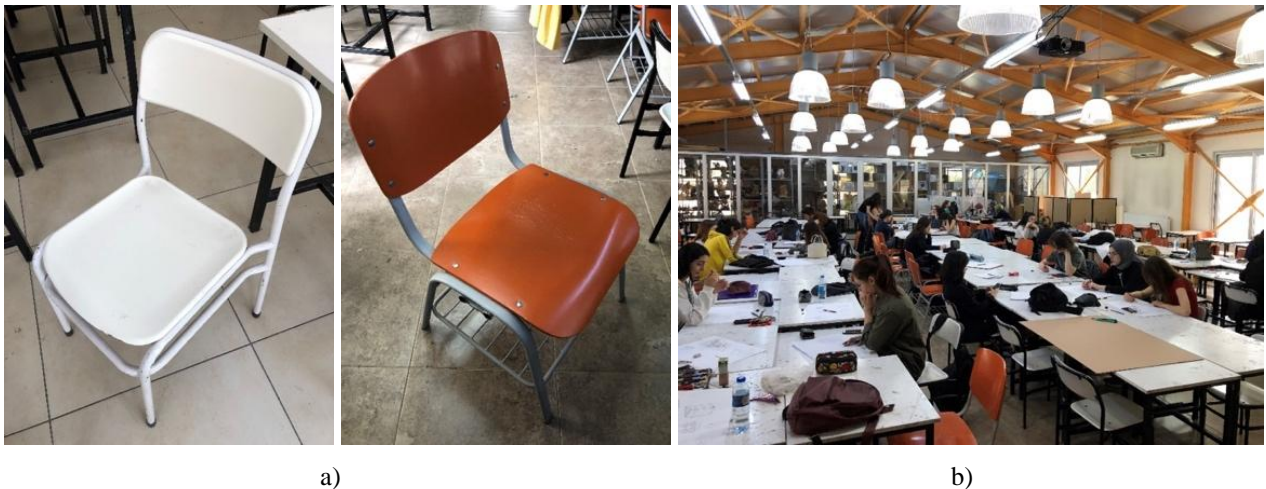


Figure 10. a) Seating Elements, b) Basic Design Studio

In this space, defined as a basic design workshop, a glass-enclosed storage area was created to allow students to store their models and drawings. However, due to the limited space in this area and the absence of storage units for student work in other studios, it was observed that works were left irregularly in corridors or in instructor offices. Additionally, during the research period, it was determined that the water installations required for basic design courses were not available within the workshop spaces, forcing students to meet this need through shared wet areas within the building.

The workshops of the Department of Interior Architecture at Kocaeli University are located within a reinforced concrete building, with painted plaster partitions and ceramic floor tiles. The workshop, designated as the basic design studio and located in a separate building, was observed to be a prefabricated structure with steel load-bearing systems. The 60x80 cm and 110x250 cm worktables used in the studios consist of 1.8 mm-thick white laminated chipboard tabletops mounted on black electrostatically painted steel box-profile legs with rigid plastic feet. Seating elements are composed of werzalit seats and backrests mounted on black electrostatically painted tubular steel frames. While the materials used are considered

adequate in terms of durability, they were found to be insufficient for providing ergonomic comfort under conditions of intensive use.

In some areas of the studio classrooms, wall surfaces were colored in yellow tones to break the perception of conventional classroom spaces. However, considering the overall furnishing layout, volumetric configuration, and dense student use, this color application was observed to have a limited effect on strengthening spatial identity (Figure 11a). In the basic design workshop, the orange color applied to steel structural elements was intended to create visual harmony with the seating elements. Lighting in the design studios is provided through both natural and artificial sources. Artificial lighting consists of white fluorescent and pendant luminaires, while natural lighting is provided through windows (Figure 11b). In studios other than the basic design workshop, the placement of windows on a single façade results in insufficient lighting conditions in some spaces. The windows also contribute to ventilation, while heating needs are met through radiators connected to a central heating system.



Figure 11. a) Studio Color Scheme, b) Lighting Conditions in the Studios

Although the workshops are designed as large-volume spaces suitable for high student populations, it was determined that there are no sound-absorbing or sound-reflective surfaces within the interiors. This condition prevents effective noise control during studio courses and negatively affects auditory comfort. Moreover, the need for instructors to conduct classes at elevated volume poses potential long-term risks to vocal health.

Each workshop classroom is equipped with a projection device, and instructors use their personal portable computers for presentation-based courses. No shared computers are available for students' short-term work or internet research, and these needs are met through personal devices. Additionally, it was observed that the existing internet infrastructure is inadequate, and incompatibilities between electrical installations and table layouts require students to reposition worktables during activities.

The Department of Interior Architecture at Maltepe University's Faculty of Architecture and Design is located in an educational building shared with other departments. Within the department, there are six design studios and one prototype-construction application studio used for interior architecture education. The studios examined have action areas ranging from 250 m² to 50 m² and 40 m², and these spaces are utilized for drawing activities, theoretical courses, model-making, and various practice-based courses. In addition, the prototype-construction application studio, referred to as the "hangar," serves department students for large-scale production and experimental work. The use of these studios and workshops is limited to interior architecture students. Two different table types are used in the design studios: 60x80 cm and 75x120 cm. The 60x80 cm tables are predominantly preferred in smaller-volume studios such as 40 m² and 50 m², and they are used as the primary work surface for individual drawing activities, theoretical courses, model-making, and critique sessions involving a single student. The 75x120 cm tables are preferred for group work and critique sessions involving multiple students; they are generally used in large-volume studios with an action area of 250 m², combined into groups of four, six, or eight.

Based on the measurements, the per-user action area provided for drawing activities and theoretical courses for the 60x80 cm tables was determined to be 1.0 m². These tables were arranged in either combined or separate configurations within the studio spaces and organized to accommodate different usage scenarios. The action area allocated for critique sessions involving a single student was measured as 1.3 m². During

model-making activities, students were observed to require a larger movement area around the tables; accordingly, the model-making action area was calculated at 3.6 m². When the existing table dimensions were insufficient for large-scale modeling, tables were combined for use (Figure 12).

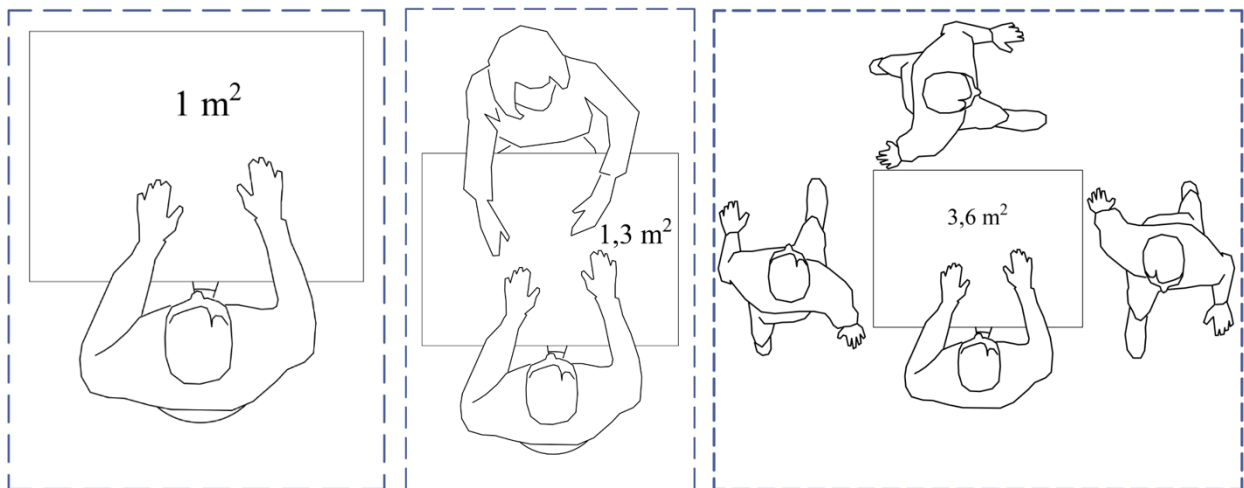


Figure 12. Per Capita Activity Area

The 75x120 cm tables used in design studios provide larger action areas for group work and multi-user applications. The action areas allocated for this table type were determined as 6.0 m² for groups of four, 8.8 m² for groups of six, and 11.7 m² for groups of eight (Figure 13). Particularly in large-volume studio classrooms, positioning these table groups in a combined layout enables spatial support for group work and collective production processes.

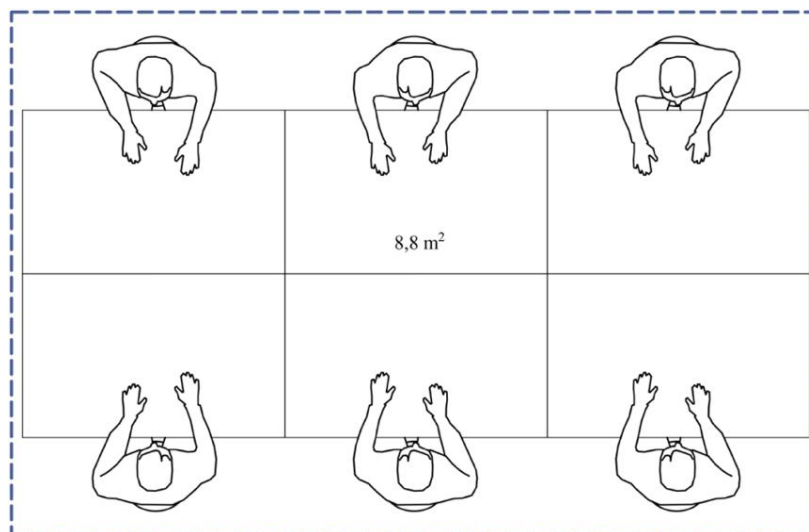


Figure 13. Group Work Activity Area

When the design studios of Maltepe University's Department of Interior Architecture are evaluated from an ergonomic perspective, it becomes evident that furnishing, materials, lighting, acoustics, and technological infrastructure should be considered together. The six design studios examined varied in size, and it was determined that these spaces include basic furnishings such as worktables, chairs, wire panel systems, whiteboards, projection devices, and an instructor podium. Variations in studio sizes have led to variable furnishing layouts within the spaces; in particular, large-volume studios have been arranged with more flexible layouts to facilitate group work (Figure 14a).

As most applications in large-scale studios with an action area of 250 m² are conducted primarily through group work, furnishings such as drawing tables, whiteboards, and display panels must be arranged to serve crowded user groups. However, the lack of angle-adjustable drawing tables limits the ergonomic use of technical drawing tools such as T-squares and set squares, especially in drawing-intensive courses (Figure 14b). This condition was observed to cause students to work in improper postures during prolonged activities. In terms of seating elements, different chair types are used in the studios, and the majority were identified as having soft surfaces and back support. These seating elements, which include back support

and adjustable height, appear to provide short-term relief for the head, neck, and back during long studio sessions and support mobility (Figure 14c). In this respect, the seating elements used in the Maltepe University case can be considered to offer a more positive ergonomic user experience than those in the other cases.

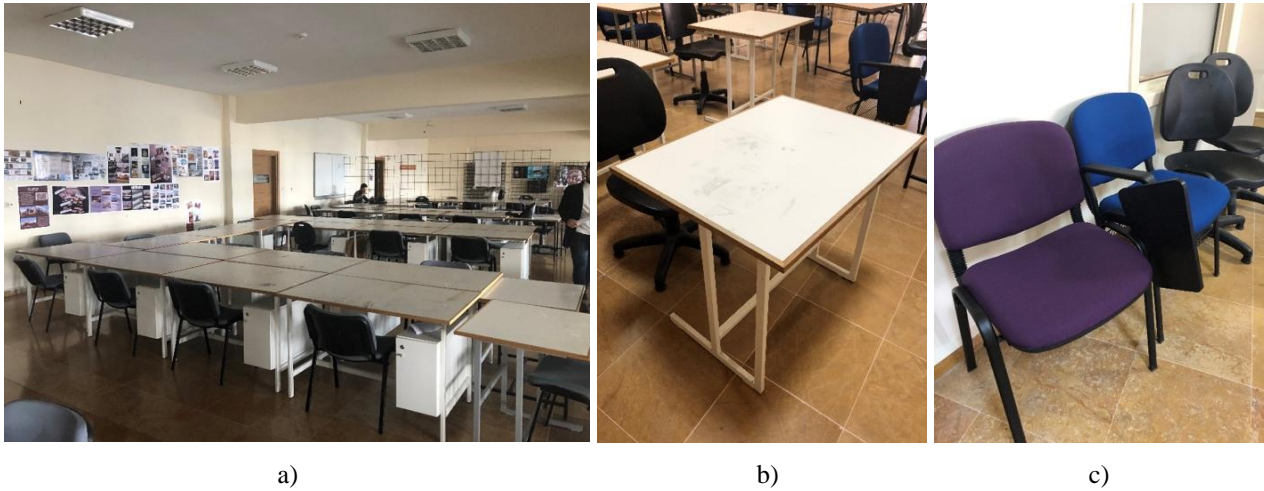


Figure 14. a) General View of the Studio, b) Drawing Tables, c) Seating Elements

Regarding storage, another furnishing-related component, it was determined that there are no dedicated storage units or stands within the studio classrooms for preserving or displaying model work, which results in student work being left irregularly on tables within the studios. However, personal storage units located in studio corridors function as areas where students can store tools, equipment, and works used during their education. In addition, the presence of storage units integrated beneath tables in large-volume studios can be considered a feature that partially compensates for this deficiency.

In terms of materials, the design studios are located within a reinforced concrete structural system; painted plaster is applied to partition surfaces, while ceramic floor tiles are used on the floors. White laminated chipboard surfaces and electrostatically painted metal leg systems are used for worktables. Seating elements incorporate different materials such as polyurethane foam, metal supports, and fabric upholstery. Although these materials are durable, they can be considered to offer a limited ergonomic experience due to surface hardness and discomfort during prolonged use. In terms of color use, no distinct color scheme was observed on wall surfaces in the studios. Spatial surfaces were largely kept neutral, and walls were mostly visually filled with student works. While this allows student works to be displayed, it also indicates that the number of panels and hanging systems is insufficient (Figure 15a).



Figure 15. a) Studio Color Scheme, b) Lighting Conditions in the Studios

Lighting conditions are provided through both natural and artificial sources. Fluorescent-type luminaires provide artificial lighting, while natural light enters the space through windows (Figure 15b). However, particularly in large-volume studios, existing lighting systems were observed to be insufficient, and a homogeneous light distribution on work surfaces could not be achieved. Windows also contribute to ventilation, while heating needs are met through radiators connected to a central heating system.

In the acoustic evaluation, auditory comfort was generally achieved in small-volume studios such as those of 40 m² and 50 m². In contrast, in large-volume studios with an action area of 250 m², the absence of sound-absorbing or sound-reflective surfaces was found to make noise control more difficult. This condition increases indoor sound levels, particularly during group work and simultaneous activities.

In terms of technological equipment, it was observed that studio classrooms include projection devices for presentations; however, for security reasons, these devices are not left in some workshops outside class hours. Students were found to conduct computer-aided work through their personal devices and the university's internet infrastructure.

The Department of Interior Architecture and Environmental Design at TOBB University of Economics and Technology operates within a spatial structure consisting of theoretical classrooms and design studios. While theoretical courses are held in the faculty building, studio classrooms dedicated to design education are located in a separate building referred to as the "Technology Center." The department admits fifty students annually, and the studio spaces are shared with other departments within the faculty. Within the Technology Center, four design studios are allocated for use by the Department of Interior Architecture and Environmental Design. These studios are configured at different scales, comprising two studios of 64 m², one studio of 104 m², and one studio of 385 m² in terms of action area. Small- and medium-scale studios primarily serve design courses with lower student density, whereas the 385 m² studio accommodates collective production, critique sessions, and exhibition activities for larger student populations. This large-volume studio offers modular use through partition systems and also serves as a space for student work to be exhibited.

Design studios predominantly utilize worktables measuring 80×120 cm. In addition, larger tables measuring 90×160 cm, mainly used by instructors, are also present within the studio spaces. Existing table layouts are arranged in a U shape within the studios, while table groups at the center of the spaces are used for group work and critique sessions involving multiple students. According to the measurement and survey studies conducted, the per-user action area provided for drawing activities at the 80×120 cm tables was determined to be 1.7 m². The action area required for critique sessions involving a single student and an instructor was measured as 2.2 m². During model-making activities, students were observed to require a larger movement area to intervene in their designs from multiple angles; accordingly, the action area for model-making activities was calculated as 4.8 m² (Figure 16). Large-scale model and prototype works were observed to be predominantly carried out in the 385 m² studio.

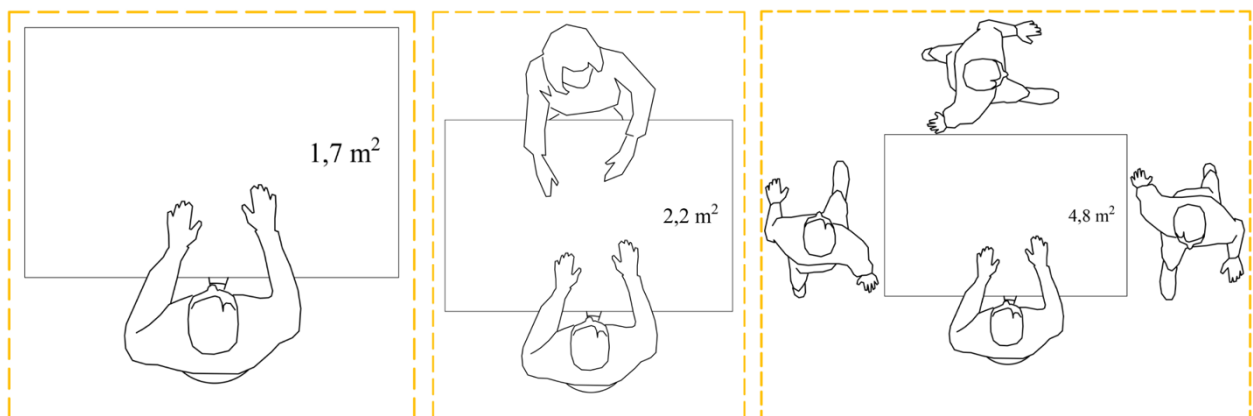


Figure 16. Per Capita Activity Area

In cases where the existing table dimensions were insufficient for critique sessions and group work involving multiple students, 80×120 cm and 90×160 cm tables were combined. In these combined table arrangements, the defined action and movement area was measured as 10 m². While this configuration supports collective production and evaluation processes, it also reveals that individual working areas become more limited under conditions of increased spatial density.

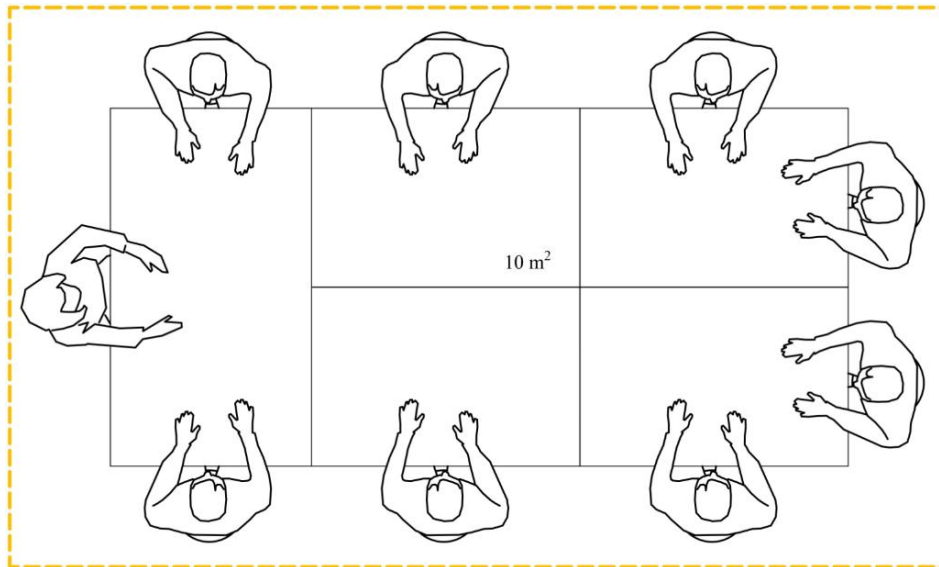


Figure 17. Group Work Activity Area

The design studios of the Department of Interior Architecture and Environmental Design at TOBB University of Economics and Technology were evaluated ergonomically within the framework of furnishings, materials, lighting, climate control, acoustics, and technological infrastructure. In the examined studio classrooms, worktables, seating elements predominantly consisting of stools, wire panels for displaying and storing student work, whiteboards, projection devices, instructor desks, and a limited number of storage units are present. Although the placement of furnishing elements varies depending on studio scale, tables were generally observed to be arranged in U- and combined shapes (Figure 18a).

In small-volume studio classrooms with limited action areas such as 64 m² and 104 m², spatial organization appears to have been designed to support individual and group work. However, the lack of angle-adjustable drawing tables makes the ergonomic use of technical drawing tools, such as t-squares and set squares, more difficult, particularly in drawing-intensive courses, leading students to adopt incorrect postures during prolonged sessions (Figure 18b).

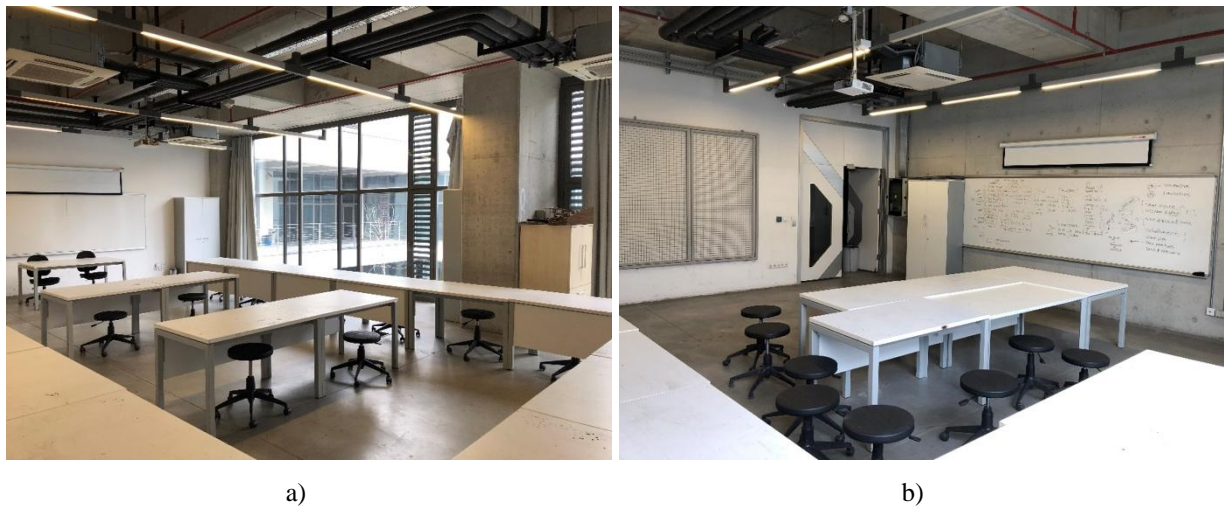
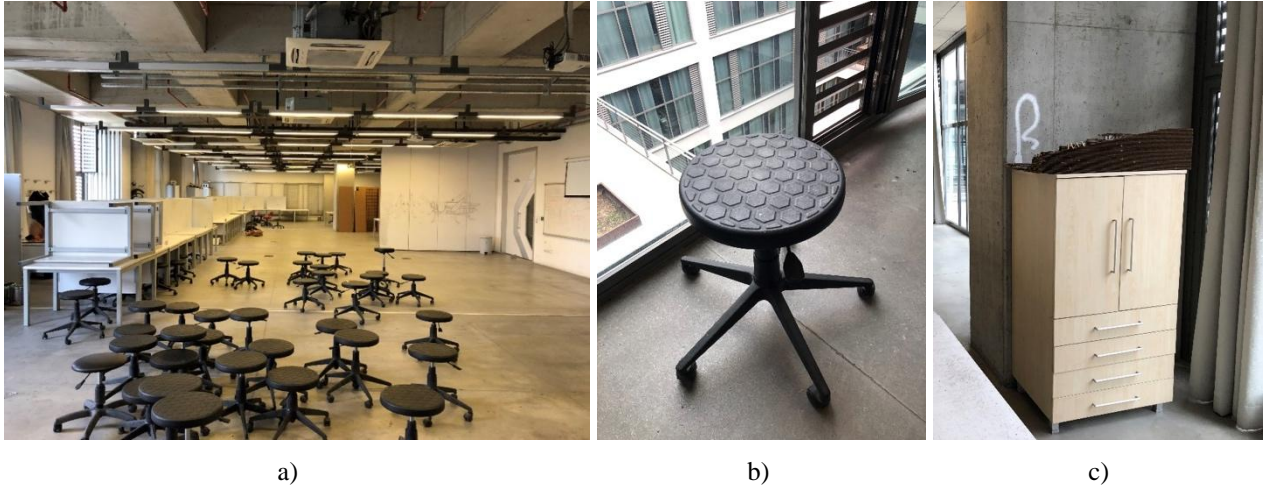


Figure 18. a) General View of the Studio, b) Drawing Tables,

By contrast, the 385 m² studio has a modular structure and can be divided into three separate classrooms when necessary, using partition systems. This large-volume studio is used for collective critique sessions, large-scale model and prototype work, and theoretical courses, and also serves as a multifunctional space for exhibiting student designs produced throughout the semester (Figure 19a). The majority of seating elements used in studio classrooms consist of stools. The absence of back support in these seating elements was observed to create ergonomic inadequacies that may cause physical discomfort in the head, neck, and back during long, intensive studio work (Figure 19b). In addition, it was determined that sufficient storage stands for model-making activities are lacking within studio spaces, and that existing storage units

primarily serve to store students' personal tools and equipment (Figure 19c). This situation results in student work being left randomly in studio corridors, thereby negatively affecting spatial order.



Şekil 19. a) Large-Scale Studio, b) Seating Elements, c) Storage Unit

In terms of material use, it was observed that the reinforced concrete structural character of TOBB ETÜ studio classrooms has been deliberately preserved; partition walls were left as exposed concrete surfaces, and polished concrete flooring was preferred. Worktables consist of white laminated chipboard surfaces supported by metal structures, while stools are designed with polyurethane bodies and height-adjustable mechanisms. Although these material choices offer advantages in durability and flexibility, comfort remains limited during prolonged use. The use of color within interior surfaces was found to be quite restricted, with minimal color applications observed only in the corridor areas where the studios are located (Figure 20a). In terms of lighting and climate control, both natural and artificial lighting are utilized in studio classrooms. However, because the windows face the building's inner courtyard, natural light levels remain insufficient, requiring supplemental lighting from linear fixtures. Despite this, visual comfort was observed to be limited in certain working areas. Ventilation and thermal comfort are provided through window systems in addition to cassette-type split air-conditioning units (Figure 20b).

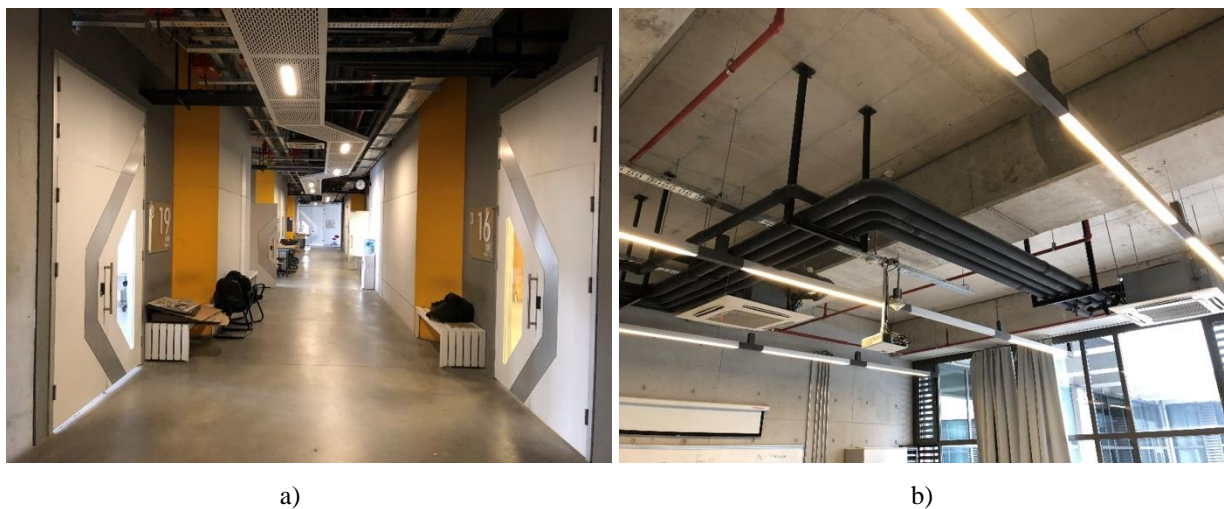


Figure 20. a) Studio Color Scheme, b) Lighting Conditions in the Studios

From an acoustic perspective, the spatial scale of small-volume studio classrooms facilitates noise control, whereas in the 385 m² studio, the absence of sound-absorbing or sound-reflective surfaces prevents adequate auditory comfort. This condition negatively affects instructor-student communication, particularly during collective work and critique sessions.

Regarding technological equipment, studio classrooms are equipped with presentation devices, while students conduct their work on personal computers with internet access available across the campus.

To enable a comparative evaluation of the per-user action-area data obtained through detailed spatial analyses across university cases, quantitative findings based on square meters are summarized in Table 1. This table aims to reveal the degree of variation among universities in action areas defined for drawing, critique, model-making, and group work activities conducted in design studios.

Table 1. Comparative Analysis of Per Capita Spatial Action Areas (m²) Across the Examined Universities

University	Studio / Workshop Scale (m ²)	Table Dimensions (cm)	Drawing / Theoretical Activities (m ²)	Individual critique (m ²)	Model-Making Activities (m ²)	Group Work / Critique (m ²)	Notes (Number of Users)
Eskişehir Technical University	150 m ² (4 studios)	75x105 cm	1.5 m ²	1.9 m ²	4.3 m ²	110x160 cm 5.4 m ²	Up to 4 students for critiques / up to 6 students for group work
		160x160 cm	-	-	-	6.7 m ²	Up to 6 students for critiques / up to 8 students for group work
Kocaeli University	80-157 m ² (7 studios), 52 m ² (3 classrooms), 211 m ² (1 workshop)	60x80 cm	1.0 m ²	1.3 m ²	3.6 m ²	-	Tables arranged in paired and single layouts; three circulation zones
		110x250 cm	-	-	-	7.3 m ²	Used in seminar rooms; suitable for group work and large-scale model making
Maltepe University	250 / 50 / 40 m ² (6 studios), "hangar"	60x80 cm	1.0 m ²	1.3 m ²	3.6 m ²	-	Commonly used in small-scale studios
		75x120 cm	-	-	-	6.0 / 8.8 / 11.7 m ²	Used in four-, six-, and eight-person group configurations
TOBB University of Economics and Technology	64 / 104 m ² (3 studios), 385 m ² (1 studio)	80x120 cm	1.7 m ²	2.2 m ²	4.8 m ²	-	U-shaped layout; centrally positioned group tables
		80x120 cm 90x160 cm (combined)	-	-	-	10.0 m ²	Combined table configuration defining action and circulation area

The spatial and quantitative findings presented above indicate that the ergonomic performance of studio spaces is addressed at different scales and with varying priorities across universities. To render these differences more readable and comparable, furnishing, materials, color, lighting, climate control, acoustics, and technological infrastructure components were evaluated at three qualitative levels: limited, partially adequate, and adequate (Table 2).

Table 2. Comparative Evaluation of Ergonomic Factors in the Examined Design Studios

University	Furnishings	Materials	Color	Lighting	Climate Control	Acoustics	Technology
Eskişehir Technical University	Partially Adequate	Partially Adequate	Needs Improvement	Partially Adequate	Strong	Needs Improvement	Needs Improvement
Kocaeli University	Needs Improvement	Partially Adequate	Partially Adequate	Partially Adequate	Strong	Needs Improvement	Needs Improvement
Maltepe University	Partially Adequate	Partially Adequate	Needs Improvement	Partially Adequate	Strong	Partially Adequate	Partially Adequate
TOBB University of Economics and Technology	Partially Adequate	Strong	Needs Improvement	Partially Adequate	Strong	Needs Improvement	Partially Adequate

The qualitative levels presented in Table 2 were classified as "open to improvement," "partially adequate," and "strong" based on field observations, photographic documentation, and survey data, with consideration of the degree to which each factor supports continuous studio use. The comparative evaluation presented in Table 2 demonstrates that ergonomic factors are met at different levels across all examined studio classrooms, while each university exhibits relatively strong aspects under specific headings. Climate control and basic furnishing elements were found to be partially adequate or strong in most cases, whereas

acoustics, color, and technological infrastructure showed more visible areas for improvement, depending on spatial scale and usage intensity. This overall pattern indicates that ergonomic adequacy requires a holistic design approach that considers studio usage scenarios collectively rather than relying on isolated interventions.

5. CONCLUSION

Within the scope of this study, the ergonomic adequacy of design studios and workshops used in interior architecture education was examined through field studies conducted at two public universities (Eskişehir Technical University and Kocaeli University) and two foundation universities (Maltepe University and TOBB University of Economics and Technology). The research was carried out based on per-user action area measurements supported by on-site observations, measured drawings, and photographic documentation. The studio spaces were evaluated under the headings of furnishings, materials, color, lighting, climate control, acoustics, and technology.

The findings indicate that none of the examined university cases fully meet ergonomic criteria holistically in their interior architecture studio classrooms. Nevertheless, each university demonstrates relatively strong aspects in certain ergonomic factors; however, these strengths alone are insufficient to ensure overall ergonomic comfort. In particular, the size of the per-user action area was found not to be a determining criterion for ergonomic adequacy on its own. When not addressed in conjunction with furnishing layout, seating elements, acoustic conditions, and technical infrastructure, even large-volume spaces may remain ergonomically inadequate.

The study further reveals that the majority of the analyzed studio classrooms consist of spaces originally designed for functions other than interior architecture education that were later adapted for studio use. This condition limits the ability of studio spaces to adequately support the application-based, interactive, and long-duration use characteristics required by interior architecture education. The absence of angle-adjustable drawing tables, the widespread use of seating elements without back support, insufficient areas for group work and critique sessions, and the inadequacy of storage and exhibition units emerge as the primary challenges within this context.

At the same time, certain university cases were observed to offer more balanced solutions in terms of furnishing diversity, ergonomic qualities of seating elements, or spatial flexibility. This observation demonstrates that ergonomic adequacy is not solely determined by spatial dimensions but is also directly influenced by the quality of design decisions and their responsiveness to usage scenarios. The ergonomic characteristics of seating elements in the Maltepe University case and the modular use of large-volume studios in the TOBB University of Economics and Technology case may be cited as representative examples of this condition.

In conclusion, the design of interior architecture educational spaces requires the holistic and simultaneous consideration of ergonomic factors alongside quantitative spatial dimensions. Design studios should not be regarded merely as spaces for instruction, but as multifunctional learning environments where production, interaction, critique, and experiential processes intersect. In this regard, re-evaluating design decisions aimed at improving the ergonomic performance of interior architecture studio classrooms in line with user needs, educational models, and principles of spatial flexibility will constitute a significant step toward enhancing the overall quality of interior architecture education.

Acknowledgements and Disclosure Statement

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