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Araştırma Makalesi - Research Article

Examination of Visual Comfort Parameters in an Educational Building

Görsel Konfor Parametrelerinin Bir Eğitim Yapısı Üzerinden İncelenmesi

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ABSTRACT

The aim of this study is to determine the satisfaction levels of indoor users in an educational structure; to examine and reveal on the basis of visual comfort parameters (lighting, material and colour/texture). In order to determine the interior physical environment quality and user satisfaction of the design studios of the Department of Interior Architecture and Environmental Design within the structure of the Faculty of Architecture and Design, Istanbul Gedik University Campus, which was chosen as the study area; it was evaluated by taking into account the opinions of students and instructors. It is important that the research is carried out on the basis of volunteerism of the users. In this context, the users were informed about the informed consent and the Voluntary Consent Form was signed. Questionnaire forms were distributed to 100 students studying at Istanbul Gedik University, Faculty of Architecture and Design, Department of Interior Architecture and Environmental Design, and 20 lecturers working in the same department, taking into account the principle of volunteering; and the study was examined in the direction of these data. In the findings obtained as a result of the survey; students and instructors find natural lighting sufficient, they are satisfied with natural lighting and ceiling material; On the contrary, it was concluded that they were not satisfied with the artificial lighting, wall material, sitting position, not ability to see the screen / board easily in all conditions, and visual and graphic design competence. The result of the research reveals that visual comfort conditions are partially provided in Interior Architecture and Environmental Design studios.

Keywords- Physical Comfort Conditions, Visual Comfort, User Satisfaction, Educational Buildings, Design Studios

ÖZ

Bu çalışmanın amacı, bir eğitim yapısında iç mekân kullanıcılarının memnuniyet düzeylerini; görsel konfor parametreleri (aydınlatma, malzeme ve renk/doku) temelinde incelemek ve ortaya koymaktır. Çalışma alanı olarak seçilen İstanbul Gedik Üniversitesi Kampüsü, Güzel Sanatlar ve Mimarlık Fakültesi binası bünyesinde İç Mimarlık ve Çevre Tasarımı Bölümüne ait tasarım stüdyolarının, iç mekân fiziksel çevre kalitesi kullanıcı memnuniyetlerinin belirlenmesi amacıyla; öğrenci ve öğretim elemanı görüşleri göz önüne alınarak değerlendirilmiştir. Araştırmanın kullanıcıların gönüllülük esasına dayalı olarak gerçekleştirilmesi önem taşımaktadır. Bu çerçevede çalışmada, kullanıcılara aydınlatılmış onam hakkında bilgilendirme yapılmış ve Gönüllü Onam Formu imzalatılmıştır. Gönüllülük ilkesi göz önüne alınarak İstanbul Gedik Üniversitesi, Güzel Sanatlar ve Mimarlık Fakültesi, İç Mimarlık ve Çevre Tasarımı Bölümü'nde eğitim alan 100 öğrenci ve aynı bölümde görev yapan 20 öğretim elemanına anket formları dağıtılmış; ve çalışma bu veriler doğrultusunda incelenmiştir. Anket sonucunda elde edilen bulgularda; öğrencilerin ve öğretim elemanlarının doğal aydınlatmayı

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yeterli buldukları, doğal aydınlatmadan ve tavan malzemesinden memnun oldukları; tam tersi olarak ise, yapay aydınlatmadan, duvar malzemesinden, oturulan konumdan her koşulda rahatlıkla ekranı / tahtayı görememe durumundan, görsel ve grafik tasarım yeterliliğinden memnun olmadıkları sonucuna ulaşılmıştır. Araştırma; İç Mimarlık tasarım stüdyoları temelinde görsel konfor koşullarının kısmen sağlandığı sonucunu ortaya koymaktadır.

Anahtar Kelimeler- Fiziksel Konfor Koşulları, Görsel Konfor, Kullanıcı Memnuniyeti, Eğitim Yapıları, Tasarım Stüdyoları

I. INTRODUCTION

For humanity to live and survive, it is needed to meet some needs. The main categories of these needs include food, leisure, and shelter. In addition to these needs, light sources are another important factor that supports main needs. For many living beings, it is not possible to survive without light. Besides its vital functions in a person's life, light is also highly important in terms of comfort in the design of interior and exterior spaces. It is also an important factor for achieving high levels of comfort. Other than the factor of light, the consideration of materials and colours/textures in interior and exterior spaces is an indicator of the degree to which the planned comfort level is supported.

Comfort is a concept that measures the satisfaction level of users about the environment they are in. In order to be healthy and productive, living spaces should provide some features related to comfort conditions depending on the usage functions. If the necessary comfort conditions are not provided, negative physiological and psychological effects occur on the users. Therefore, it is an important requirement to provide visual comfort, which plays a role in a large part of human life.

Visual comfort, one of the most significant factors that affect the productivity of individuals, is achieved by the provision of all forms of environmental conditions regarding daylight, natural lighting, and colour.

Educational buildings, which are work environments where students and instructors spend a long time during the day, are also spaces that play an important role regarding academic development. Because physical conditions of interior spaces within an educational environment will directly affect the functionality of education in a positive or negative way, spatial comfort may be considered the most important factor at this point. In terms of determining user satisfaction and spatial quality in these spaces where education-instruction activities are carried out, it is very important to provide favourable comfort conditions [1].

As classrooms in educational buildings are spaces that are utilised throughout an entire day, these spaces need to be environments that are sufficiently and uniformly lit, preferably through natural lighting. Spaces that are lit with daylight also need to include various shading elements against glare. Regarding these issues, the comfort-related expectations for working spaces increase. These expectations are met by providing user satisfaction. Visual comfort is related to the parameters of lighting, material and colour/texture.

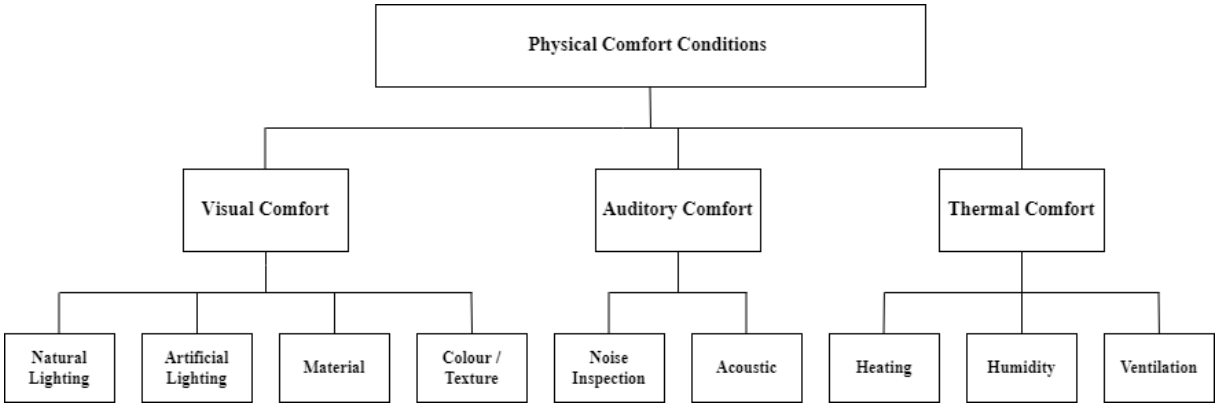

Figure 1. Physical comfort conditions and parameters [2]

Ergonomics; is a concept that aims to enable the individual to work in the most favorable comfort conditions and at the highest efficiency [2]. Therefore, it is important that visual, auditory and thermal comfort conditions are provided in addition to many elements such as spatial setup, furniture, etc. for ergonomic design

conditions in design studios. Visual comfort; natural lighting, artificial lighting, material, color/texture, auditory comfort; noise control and acoustics, and thermal comfort are related to heating, humidity and ventilation (Figure 1).

In this study, only visual comfort and its sub-parameters were discussed, and what kind of solutions should be produced in order to provide visual comfort. The purpose of this study is to examine and present the satisfaction levels of users of interior spaces in an educational building based on visual comfort parameters (lighting, material and colour/texture). This study consisted of three parts as the review of the relevant literature, the implementation of the user satisfaction survey and analysis of the responses, and the discussion of the results. After the literature review, in order to determine the interior physical environment quality and user satisfaction of the design studios of the Department of Interior Architecture within the Istanbul Gedik University campus, Faculty of Architecture and Design building, which was chosen as the study area; were evaluated by taking into account student opinions. The survey was implemented with 20 instructors and 100 students who had been experiencing the studied spaces in addition to receiving or providing education to determine their satisfaction levels as users with the physical environmental quality of the interior spaces. With the survey, by obtaining information about the satisfaction levels of the included students and instructors with the interior spaces of the studios and their expectations, some improvements were recommended regarding user needs [1].

It was a limitation of this study that only 1 large studio was examined due to limitations of time and the availability of all studios (classes, workshops, etc.), while including the remaining studios in future studies on this topic may contribute further to the literature.

This topic of study is greatly important and necessary in terms of the reflection of visual comfort criteria in the architectural/interior architectural designs of educational buildings that will be built in the future. It is also seen as important in terms of preceding more comprehensive scientific studies to be conducted in this field.

II. VISUAL COMFORT PARAMETERS

A. Lighting

An interior space is a shell that is completed with the combination of elements such as color, texture, material, lighting, mechanics, and acoustics, based on a determined concept and usage functions. These functions in the interior space are the entirety of constructions that are based on a concept, meet that concept, are shaped architecturally, and have spatial interrelations with each other. All elements used in the space, including the wall material, flooring material, ceiling material, the colours, textures of these materials, and the type of lighting that is preferred, constitute visual comfort. While visual comfort is a way of perception that varies for each user, it physically and mentally affects the user in a positive or negative way. The users of the space participate in different activities in different parts of the space. Spaces should respond to the activities to be performed in those spaces and the requirement of these activities, and the lighting design should provide the spatial design with the necessary comfort. For the existence of visual comfort, first of all, the environment must be illuminated by natural or artificial means. At the same time, some conditions must be fulfilled in order to ensure that the visual comfort conditions are fully achieved [3]. These conditions are that the illuminated object or surface is in the field of view and the relevant information about this object or surface is transmitted to the brain with the help of eyes and nerves [4]. For this reason, the level of lighting is also important. If it is an environment with very intense light, the eyes of the users will be dazzled. The level of illumination should be determined according to the nature of the work done. At the same time, it is important to use natural lighting without the need for artificial lighting as much as possible. If natural lighting is not sufficient, artificial lighting should be used [3]. Every space needs a different lighting design according to the action to be carried out in it [5].

Visual comfort is realized under the condition that physiological and psychological comfort is together. Physiological comfort is related to the measurable magnitudes (quantity) of the lighting, and psychological comfort is related to the perceived magnitudes (quality) of the lighting. It is necessary to fulfill the user's needs in order to provide psychological comfort [6]. For visual perception, there must be contrasts in colour and luminance in the area we are looking at [7]. Therefore, in determining the quantity of illuminance, it is necessary to determine the majority of illuminance first. However, glare control should be done and adaptation should be provided to ensure comfort conditions [8].

In design education, some of the spaces in which students and instructors spend most of their time are design studios. Lighting design in studios affects the mental state, health and productivity of students and instructors. Therefore, spatial comfort is determined by several factors such as the spaciousness of the studio, its

ceiling height, window sizes, lighting sources, ventilation, and seating arrangement. The most important factor in lighting design studios is natural lighting.

Natural lighting depends on daylight. Providing the necessary level of visual comfort conditions in interior spaces is important to increasing visual and mental performance in educational buildings of universities, raising the learning performance of students, and keeping motivation and productivity high for both students and instructors [9].In the classroom environment, students consider lighting a significant design element[10]. The use of natural lighting in design studios involves the creation of a visual environment that has the appropriate conditions and can be utilised by students and the provision of visual needs in an effective and comfortable way with minimal energy consumption. In studios, for students to read and write on the horizontal plane and concentrate on the screen or board on the vertical plane, it is needed to provide sufficient lighting and adjust the angles of lighting to prevent glare [11].

In order to prevent the high glare contrast between the window and the wall on the wall surfaces where the existing windows are located in the design studios, care should be taken to ensure that the wall surface is light coloured and non-mirroring, reflecting the light diffusely [12].Artificial lighting system of the studios; If it is created with semi-indirect or indirect lighting devices, the glare contrast between the ceiling and the light source must be prevented. In order to achieve this, the ceiling should be in light colours, especially white. In studios, to avoid glare caused by daylight, direct sunlight entering the volume, using shading devices with solar control elements; in order to prevent the glare problem caused by the artificial lighting system, the luminance values of the light sources are reduced and they are brought closer to the glare index values; measures such as enlarging the visible area of the light source or reducing the light intensity in the direction of the source can be taken [13].

B. Material

One of the parameters that provide visual comfort in the interior is the material. The choice of building materials used is important in terms of visual comfort. Poor quality material choices can adversely affect human health and comfort. It is necessary to pay attention to the quality of the materials used in the interior as well as their visuality. While an interior designed with poor quality and wrong materials can harm human health, an interior designed using quality and correct materials can offer its users a healthy space for action. In addition, the way these materials are used is one of the important factors that determines the interior quality and provides comfort.

Material use in interior and exterior space designs has a very broad spectrum, especially nowadays. Each material has unique surfaces, and these surfaces are made even more unique by differentiating them using various other materials. For example, for a wooden object, while sanding it will create a different texture, painting it will result in a smoother surface. When it is varnished, a surface that is both smooth and shiny is obtained. These preferences vary based on the place where the material will be used. Different materials lead to different perceptual effects in the space such as spaciousness, depth, warmth or coolness, and hardness and softness [14].

After examining the type of materials to be used in the interior, how they are illuminated and what their colors will be, it is important for user satisfaction what kind of surfaces these materials have and what textures they have on those surfaces. An object without texture appears neutral, that is, abstract. Having a texture makes it more understandable and defined.

The use of several materials together in the formation of a space is realized due to the properties of the materials and their suitability for the places used [15]. Thus, the variety and importance of the visual effect that each material will create in the interior, where several materials are used together, is determined [16]. In addition to their chemical, physical and mechanical properties, materials also create visual effects with their properties that vary from material to material, such as their size, color, and texture. With these properties, the material creates visual and intuitive perceptual effects such as width, depth, light etc., cold, warm, soft and hard in the space. Transparent or reflective materials, mirrors, graphic images can create virtual effects in the perception of the space.

Textile-based floor coverings; Although it seems to be suitable for a studio environment in terms of sound absorption, aesthetics, impact resistance, walking safety and comfort, it is a dust-repellent material, and it is difficult to clean and maintain. Artificial and natural stone materials; It is not preferred much because of cold contact, hard surface and noise generation. However, it is easy to clean and its physical strength is better than other floor coverings. Parquets with wooden floor coverings are comfortable, aesthetic, simple to clean and maintain materials [3].

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Looking at the materials used in the design studios; In order to choose the type of wall covering material, application method and surface properties, first of all, the actions in this area should be analyzed. In addition to the importance of daylight and air quality, the wall covering material should also be easy to clean, and its color and texture should be compatible with the studio. Ceiling covering material, which is another material; It is selected by considering both functional and formal aspects in today's buildings. Acoustic ceilings are generally preferred in multiple working areas such as design studios. In these ceilings, aesthetic and easy accessibility criteria are also important. Depending on the characteristics of the space, some ventilation, electrical and installation elements can be hidden in the ceiling or left open. Another material is the floor covering material. As with every material, the purpose of use of that space and the actions performed there must be addressed in order to choose the covering of the floor covering appropriately [3].

C. Colour/Texture

One of the important parameters in providing visual comfort is the colour factor. The light source plays an important role in the perception of colours. Choosing the right colour and light source according to the function of the designed spaces is important in terms of providing comfort for the spaces in which action will take place. Materials, textures on surfaces, color selection and lighting should be considered together in interior design [17]. All materials used in the interior or exterior of the building, whether natural or artificial, have a color. Thanks to this feature, it is also a part of the architectural design [18]. Color has an important place in providing visual comfort, both with its psychological and illusion effects. In addition, it is important to take into account the perceptual properties of color in order to increase efficiency in learning activities [2].

The psychological properties of colors should be taken into account in the design of the space because colors affect the physical, mental and psychological characteristics of people [19]. Light and color are an inseparable whole, and should be considered together, in order for color to be perceived better and to create the right psychological effects [20]. The use of colors on the ceiling, wall, and flooring of the space and also has the characteristics of affecting human perception. In this way, with the use of color, the desired perception can be achieved with color in cases such as wide perception in narrow spaces or vice versa [21].

In addition to its performance and productivity-enhancing features, on-site and correct color applications in studios can also cause negative effects such as fatigue, increasing stress, reducing visual perception, and damaging eyesight when used unconsciously [2]. Light colors illuminate the place where they are used; on the other hand, it is determined by experimental studies that dark colors make it dark and difficult to understand [22]. The direction, intensity, and glare of the light used have an effect on changes in the apparent extent of the color [16]. Warm or cold spaces can be created with different textures. On the other hand, color is the design element that most affects the perception of space. While energy can be obtained by using red, peace and serenity can be achieved with green [23].

In the selection of colors used in the design of the space, the difference in the dimensions of the walls, floors and ceilings affects the perception of the space, and the physical and psychological effects of the products to be used on the surfaces (such as furniture, lighting, etc.) [17]. Another important factor in this effect is the material and texture of the surfaces to be colored. This importance emerges in the perception of color. It is necessary to perceive the color correctly, especially in the interior spaces, and to illuminate the carefully selected colors from the color circle suitable for the space [24].

Based on this information, the color tones should be correctly analyzed by the users of the space and chosen in accordance with their purpose. In the design studios, which are the subject of the research, the color factor should be taken into account in terms of both providing the physical conditions and not being affected psychologically by the users.

III. FIELD STUDY

A. Material and Method

As in all developed and developing countries of the world, the issue of education-instruction is also highly important in Turkey due to the large proportion of the young population. Educational buildings are spaces where students spend a large part of their time that play a significant role in their academic development [1]. Beyond any doubt, the spaces in these buildings where especially students and instructors spend their time most intensively are classrooms.

As the physical conditions of the interior spaces in an educational environment will have a direct positive or negative effect on the functionality of education, spatial comfort is one of the most important issues at this point.

The provision of physical comfort conditions in these spaces where education processes take place is highly important in the context of determining user satisfaction and spatial quality. Accordingly, with the design of interior spaces where learning occurs in line with comfort parameters, it will be possible to provide suitable conditions for visual comfort principles, and thus, meet the visual comfort needs of both students and instructors that are the users of these spaces [1].

In this user-centred study, 100 students and 20 instructors in the study area were reached, and they were included in a face-to-face survey. All participants for the implementation of the survey were selected through random sampling. The satisfaction levels of students of the Department of Interior Architecture and Environmental Design at the education institution that was included in this study and instructors of the department who were full-time employees were asked and aimed to be determined.

Within the Interior Architecture and Environmental Design department, there are 5 studios on 5 floors, 1 on each floor, with equal conditions. For this reason, the research was carried out on a single studio type. On some floors, 1 large studio can be transformed into 2 small studios, depending on the needs, during different training periods. However, no such intervention was made at the time the research was conducted.

This study employed a quantitative research design that aimed to learn about the views of the target audience about visual comfort in interior spaces within a certain space and time interval. The survey that was used in this study to collect data was developed by the researcher, and its validity and reliability were tested using the factor analysis and Cronbach's alpha methods. As a result of the Cronbach's alpha test regarding the reliability of the measurement instrument, the overall Cronbach's alpha internal consistency coefficient of the survey form was determined as 0.796, and it was determined that it had high reliability.

For this evaluation, a survey was conducted with 20 instructors and 100 students, who teach and study in the existing design studios of the Faculty of Architecture and Design, Department of Interior Architecture and Environmental Design of the educational institution and who have also experienced the spaces. The survey questions directed were evaluated in four factors:

Table 1. Survey questions directed to users

Lighting	• The type of lighting used in the studio • Artificial lighting adequacy in the studio • Natural lighting adequacy in the studio • Avoiding sitting by the window, disturbed by the light, in sunny weather
Material	• The window material of the studio • The floor material of the studio • The wall material of the studio • The ceiling of the studio • The adequacy of the studio floor material in terms of visual comfort • The adequacy of the studio wall material in terms of visual comfort • The adequacy of the studio ceiling material in terms of visual comfort
Color	• The wall color of the studio • The amount of condensation on the wall (the amount of spill) • Satisfaction with the wall color of the studio
Spatial	• Being able to see the screen/board easily from any sitting position in the studio • Being able to see the screen easily from any sitting position in the studio

With the survey that was implemented with users who had been experiencing the examined studio environments, by obtaining information about the satisfaction levels of the included students and instructors with

the interior spaces of the studios and their expectations, some improvements were recommended regarding user needs. The analyses of the obtained survey data were conducted using the Excel program with the method of Vertical Analysis (Percentage Analysis). The field study process was carried out by collecting and analysing the following data:

- Literature review about the concept of visual comfort and its components,
- Realization of the pilot study,
- Asking the users 16 closed-ended survey questions,
- Analysing the users' responses to the survey questions as a Likert-type scale,
- Discussing the obtained results.

Within the scope of the research, a questionnaire was applied with the approval decision of Istanbul Gedik University, Ethics Committee dated 1.01.2022 and numbered E-71457743-050.01.04-2022.137548.8-281 (see Appendix-1).In order to test the reliability of the study, a pilot survey was conducted with 25 users within the scope of the research. Afterwards, the final survey study was started. The pilot survey study was considered as the preliminary study of the survey. The questionnaire was carried out by volunteers, with the method of filling out voluntarily, with a total of 120 participants, including 100 students and 20 instructors. With the analyzes envisaged in the study, it is aimed to determine the satisfaction of the users towards the design studios and to create a preliminary resource for the future studies on the subject.

B. Characteristics of the Study Area

The areas selected for the field study were design studios of the Department of Interior Architecture and Environmental Design in the building of the Faculty of Architecture and Design at Istanbul Gedik University, which is located on the Anatolian side of Istanbul, which is one of the most economically, historically and socio-culturally prominent cities of Turkey. Within the Department of Interior Architecture and Environmental Design, there are 5 studios with equal conditions. Since all studios have equal conditions, 1 of them was examined within the scope of the study.

Figure 2. Study Area [25]

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Figure 3. The Design Studios Plan (Anday Türkmen's Photo Archive 2022) [26]

General information about the Design Studio is as follows:

- The overall capacity of the Design Studio is 33 people.
- The size of the Design Studio is 105 m^2 (width: 8.57 m x height: 12.86m).
- The ceiling height of the Design Studio is 240 cm.
- The flooring material of the Design Studio is linoleum.
- Design Studio's floor covering color is dark orange.
- The wall material of the Design Studio is water-based paint.
- The wall color of the Design Studio is mango on the blackboard facade and gray on the other facades.
- The ceiling material of the Design Studio is a white rock wool panel suspended ceiling.
- The material of the doors and windows in the Design Studio is aluminum.

Figure 4. The Design Studios (Anday Türkmen's Photo Archive 2022) [26]

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Figure 5. The Design Studios (Anday Türkmen's Photo Archive 2022) [26]

Following the review of the literature relevant to the physical comfort conditions of design studios, these conditions were investigated under the parameter of visual comfort in this study. The survey was conducted with 100 students and 20 instructors for the readability and better analysis of numbers of users and percentage ratios on plots. The survey included a total of 16 questions created based on the literature review including 5 questions on lighting, 2 questions on color, 6 questions on material, and 3 questions on space. The closed-ended questions constituted a 5-point Likert-type scale.

IV.RESULTS

According to the demographic data obtained with the implementation of the survey, 61% of the students were female, and 39% were male, whereas 70% of the instructors were female, and 30% were male (Table 2).

Table 2. Demographic characteristics of the participants

Demographic Characteristics	Students	Instructors
Female	61	14
Male	39	6

It was determined that 79% of the students and 65% of the instructors were satisfied with the natural lighting in the design studios, while 63% of the students and 60% of the instructors were generally dissatisfied with the artificial lighting(Table 3).

Table 3. Views of the participants about forms of lighting

Satisfaction Level	Natural Lighting		Artificial Lighting	
	Students	Instructors	Students	Instructors
Not satisfied at all	5	2	39	4
Not satisfied	7	2	24	8
Neither satisfied nor dissatisfied	9	3	6	3
Satisfied	71	6	19	2
Highly satisfied	8	7	12	3

The participants were asked whether they avoided sitting near the window as they were uncomfortable with light on sunny days, and it was found that 62% of the students spelling sitting near the window, whereas 55% of the instructors did not avoid it (Table 4).

Table 4. Views of the participants about sitting near the window

Preference of Sitting Near the Window	Students	Instructors
I absolutely avoid it	28	1
I avoid it	34	4
No idea	18	4
I do not avoid it	13	3
I never avoid it	7	8

The vast majority of the students, at a rate of 71%, stated that they were satisfied with the door and window material, while 50% of the instructors said they were generally dissatisfied (Table 5).

Table 5. Views of the participants about door and window material

Satisfaction Level	Students	Instructor
Not satisfied at all	4	7
Not satisfied	13	1
Neither satisfied nor dissatisfied	6	2
Satisfied	67	6
Highly satisfied	4	4

While 67% of the students stated that they considered the flooring material of the studios visually adequate, 75% of the instructors found the material visually inadequate (Table 6).

Table 6. Views of the participants about flooring material

Adequacy of Studio Flooring Material	Students	Instructors
Not adequate at all	9	8
Inadequate	7	7
No idea	17	2
Adequate	22	2
Highly adequate	45	1

When they were asked about their views of the wall material of the studios, 64% of the students and 60% of the instructors reported that they found it visually adequate in general (Table 7).

Table 7. Views of the participants about wall material

Adequacy of Studio Wall Material	Students	Instructors
Not adequate at all	11	2
Inadequate	18	3
No idea	7	3
Adequate	36	8
Highly adequate	28	4

In their views about the ceiling material of the studios, 83% of the students and 65% of the instructors found the ceiling material visually adequate (Table 8).

Table 8. Views of the participants about ceiling material

Adequacy of Studio Ceiling Material	Students	Instructors
Not adequate at all	1	2
Inadequate	12	3
No idea	4	2
Adequate	61	4
Highly adequate	22	9

To the question about the amounts of condensation (sweating) on the walls of the studios, 84% of the students and 80% of the instructors responded that there was no condensation (sweating) on the walls (Table 9).

Table 9. Views of the participants about condensation (sweating) on walls

Amount of Condensation (Sweating) on Walls	Students	Instructors
There is absolutely none	68	14
There is almost none	16	2
No idea	12	1
There is some	4	2
There is much	0	1

In their responses, 68% of the students and 75% of the instructors stated that they were not satisfied with the color of the walls of the studios (Table 10).

Table 10. Views of the participants about wall color

Satisfaction Level	Students	Instructors
Not satisfied at all	57	9
Not satisfied	11	6
Neither satisfied nor dissatisfied	0	3
Satisfied	28	1
Highly satisfied	4	1

When asked about their satisfaction with their ability to see the screen/board clearly from any anglein any seat they take in the studio, 57% of the students and 80% of the instructors were found to be dissatisfied (Table 11).

Table 11. Views of the participants about their ability to see the screen/board clearly from any angle and seat

Satisfaction Level	Students	Instructors
Not satisfied at all	9	1
Not satisfied	26	1
Neither satisfied nor dissatisfied	8	2
Satisfied	34	2
Highly satisfied	23	14

More than half of the participants were not satisfied with the adequacy of the visual and graphical elements on the walls of the studios, with a rate of 60% among the students and a rate of 70% among the instructors (Table 12).

Table 12. Views of the participants about the adequacy of visual and graphical elements on walls

Adequacy of Visual and Graphical Elements	Students	Instructors
Not adequate at all	38	11
Inadequate	32	3
No idea	9	1
Adequate	13	2
Highly adequate	8	3

V. DISCUSSION AND CONCLUSION

The limited opportunities offered by the physical environment in educational settings in which students and instructors spend a significant part of their daily lives not only affect the performance of the instructor and the success of the student but also the physiological-psychological health of both user groups. In this case, it is important to implement ergonomic design principles that will address all needs of users and create an appropriate educational environment.

In this context, this study that aimed to measure user satisfaction levels related to physical environment quality in interior spaces of design studios of the Department of Interior Architecture and Environmental Design of a university focused on investigating and presenting these satisfaction levels in the scope of visual comfort parameters (lighting, material, color/texture). This study is considered important for the establishment of basic principles that need to be paid attention to in terms of visual comfort before the design step in educational buildings. This topic that was examined in this study is crucially important in terms of the reflection of visual comfort parameters in the architectural/interior architectural designs of educational buildings to be designed in the future. Moreover, this study is seen as significant in that it provides a basis for more detailed scientific studies to be carried out.

In this study, it was determined that the educational building where the survey was implemented had a set of problems in terms of physical comfort in general and visual comfort in particular. To increase the physical performance of students and instructors who are the users of the building and ensure their physiological and psychological satisfaction, some solutions should be brought, and the comfort levels in their working environments should be increased.

Accordingly, the data that were collected in this study are synthesised in Table 13.

Table 13. General satisfaction statuses of users

Assessment Criteria		**Students**		**Instructors**	
		Satisfied	**Dissatisfied**	**Satisfied**	**Dissatisfied**
Lighting Criteria	Satisfaction with Natural Lighting	x		x	
	Satisfaction with Artificial Lighting		x		x
	Preference of Sitting Near the Window		x	x	
Material Criteria	Satisfaction with Door and Window Material	x		x	
	Satisfaction with Flooring Material	x			x
	Satisfaction with Wall Material	x		x	
	Satisfaction with Ceiling Material	x		x	
Color Criteria	Amount of Condensation (Sweating) on Walls	x		x	
	Satisfaction with Wall Color		x		x
Spatial Criteria	Ability to See the Screen/Board Clearly	x		x	
	Adequacy of Visual and Graphical Elements		x		x

As summarised in Table 13, while the users stated that they were dissatisfied with artificial lighting as a form of lighting, they said they found natural lighting adequate in parallel with the frequency of window openings,

and they were satisfied with it. Based on this result, it may be stated that lighting in the examined interior spaces was provided by natural light, and the users preferred natural lighting. Additionally, natural lighting has gained scientific acceptance in that it contributes to the calm, peaceful working processes of individuals, and it has increasing effects on productivity and performance. However, it is necessary to prevent glare caused by direct sunlight. In order to avoid glare according to the position of the sun and the open or closed condition of the air, besides the curtain, shading elements and even daylight guidance systems can be applied in order to make the most efficient use of daylight [11]. Artificial lighting satisfaction can be created by providing lighting control with dim (dimming according to light) controlled luminaires and motion sensors [27].

When the opinions of the users regarding the satisfaction with the materials of the doors and windows belonging to the design studios are consulted; it was concluded that both user groups were satisfied. If windows and doors are located on the interior wall, their duties are to provide the transition between spaces, to provide visual connection, and to provide indirect light and air to the dark and stuffy spaces inside [28]. From this point of view, it can be said that the material of doors and windows has no effect on satisfaction in terms of visual comfort.

Considering the users' preferences for sitting by the window; It is seen that the students are not satisfied and the instructors are satisfied. In the classroom layout scheme, since the instructor is located on the wall, instructor is minimally affected by the sun, and therefore the satisfaction with the studio can be at a good level. However, the studio, which has two facades, is located on the south-west axis. Therefore, the position of the sun in the afternoon affects the student desks that are close to the windows. Therefore, glare problem occurs in that area. This results in an inhomogeneous distribution of daylight. As a solution, it may be suggested to change the seating arrangement [29].

In the design studios where the survey in this study was conducted, the students were satisfied with the flooring material, whereas the instructors were not. Indeed, because various demands are in question for the selection of flooring materials, it is highly difficult and even impossible most of the time to decide on a single material.

When the satisfaction of the users with the wall material in the design studios is questioned, it is seen that the satisfaction is provided on the basis of both the student and the lecturer. Both user groups in this study responded to the question about their satisfaction with the ceiling material positively.

With a suspended ceiling finish under the existing ceiling, a ceiling was created to hide the installations passing through the ceiling, and at the same time to perform acoustic control, fire prevention and aesthetically serve visual comfort [30]. Considering the satisfaction of the users regarding the amount of condensation on the wall; it has been determined that both students and instructors are satisfied.

When students and instructors were asked about their satisfaction with the condensation (spill) situation on the walls in the design studios, both user groups stated that they were satisfied. No condensation (spill) was observed on the walls during the on-site observations and examinations carried out in the design studios.

In terms of color as a parameter of visual comfort, both the students and instructors in this study were dissatisfied with the color of the walls of the design studios. Several studies have revealed that the factor of color has an important role in the motivation of students and instructors and contributes positively to their social communication and behaviours [31]. It is also stated that the light reflection rate of wall surfaces with light colors is higher than 50%. Thus, it is recommended to use darker shades on wall surfaces from where light is reflected directly [2]. Based on this recommendation, it will not be a very good choice to use neutral color shades on all wall surfaces in design studios. In line with all these phenomena, the wall color of the design studios may be re-evaluated by modifying their current color.

Considering their ability to see the screen/board clearly from any angle in any condition from where they sat, both user groups stated that they were satisfied with this issue. Jayaratne and Fernando (2009) reported that the seating arrangement in a classroom is an issue that affects the health of students in the ergonomic sense [32]. The angle and distance of the position where the student sits to the board are ergonomically highly important. Similarly, considering the same issue from the perspective of the instructor, while the instructor is in a position facing the student from where the board is, their angle and distance to the student are also ergonomically important. Furthermore, it is believed that a modification to be made in this area will have a positive contribution to the communication and interaction between the student and the instructor for information exchange.

Finally, considering the visual and graphical elements on wall surfaces in the design studios, it was determined that both user groups were dissatisfied. Yavuz Öden (2021) emphasised that the importance of visual arts in a space is vast [33]. In this context, as an instrument of communication for people and for the transmission of intended messages through symbols contained by visual expressions, visual and graphical elements will contribute to visual comfort. Additionally, considering that the area of this study was a design faculty, as also stated by Karaoğlu Can and Yavuz (2020), it is undeniable that students receiving architecture/interior architecture education prepare their project presentation sheets with unique designs, comprehensible textual and visual symbols, and powerful graphical narratives [34]. Therefore, wall surfaces can include these sheets that have high levels of visual expression as the products of students derived from their courses. This way, the studio's interior space walls will function as exhibition elements that are no longer monotonous in terms of visual comfort, and students will be encouraged for their success with the inclusion of their work on these surfaces.

According to the results of this study, in the Interior Architecture and Environmental Design studios examined in this study, a sufficient level of visual comfort conditions could be achieved, and it was determined that the users were generally satisfied with the current situation. Besides, the satisfaction of visual comfort conditions by studios that are learning spaces at the centre of design education carries great importance for preventing physiologically and psychologically negative effects on not only students but also instructors and increasing their learning and teaching performance in studios. Hence, for creating an effective, comprehensive and positive learning environment, in addition to other parameters of physical comfort conditions, it is also needed to provide visual comfort conditions.

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