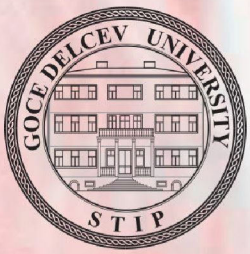

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IMPACT OF NEW LIGHTING TECHNOLOGIES AS AN IMPORTANT ELEMENT OF THE INTERIOR

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Abstract

When it comes to house renovations, lighting is an important but sometimes disregarded subject. It alters the way a space is perceived as being sized, adds atmosphere, and most significantly, it may change how you feel. More goes into good lighting design than just picking a stylish lampshade. In actuality, lighting design consists of three fundamental components. When used properly, ambient lighting, task lighting, and accent lighting may radically change the atmosphere of your home or workplace, making it a more comfortable and relaxing place to be. Lighting includes the use of both artificial light sources like lamps and light fixtures, as well as natural illumination by capturing daylight. Daylighting (using windows, skylights, or light shelves) is sometimes used as the main source of light during daytime in buildings. This can save energy in place of using artificial lighting, which represents a major component of energy consumption in buildings. Proper lighting can enhance task performance, improve the appearance of an area, or have positive psychological effects on occupants. Indoor lighting is usually accomplished using light fixtures and is a key part of interior design. Lighting can also be an intrinsic component of landscape project.

Key words: *lighting, interior design, effects of light on people, interior design with natural lighting.*

INTRODUCTION

Interior design strives to maximize and harmonize the uses that will be made of the built environment, going beyond merely enhancing the aesthetic or acoustic quality of an interior space. As a result, it is "useful, beautiful, and beneficial to stated aims, such as enhancing productivity, selling goods, or improving lifestyle," in the words of the U.S. Bureau of Labor Statistics. Interior design is a profession that adapts to shifts in the business objectives, organization structure, technology, and demography of a company.

Interior design as a human endeavor dates back many millennia. It is relatively new as a cohesive profession designated by the term "interior designer." Many experts attribute its inception to the growth of interior design as a profession distinct from architecture in the early 20th century. The residential sector was the main focus of this technique in the early decades. By the 1940s, persons offering services to a small but expanding group of commercial clients were the main users of the phrases "interior design" and "interior designer." As the economy recovered after World War II, nonresidential design—including that of offices, hotels, shops, and schools—became more significant. Residential and contract or business interior design are the two main types. As structures and materials get more technologically complex and rules and standards become more stringent, interior design is now becoming more specialized. An interior environment that answers consumer problems and connects space to corporate plans and goals is created by using technological and artistic solutions within a building. Interior design is a multifaceted profession. These solutions improve the tenants' quality of life and culture while also being visually pleasing and useful. The physical location and social context of the project are acknowledged in the designs, which are developed in reaction to and coordination with the building shell. Designs must follow all statutory and regulatory standards and

promote environmental sustainability. Through the use of architectural and design aspects, interior design may also affect the choice of real estate that will meet the demands of the business. By doing research, analyzing it, and incorporating it into the creative process, the interior design process adheres to a methodical and coordinated approach that satisfies the client's demands and available resources while producing an interior environment that achieves the project's objectives. The varied spectrums produced by the various forms of light have an impact on humans both physically and mentally. These outcomes are the less tangible and more readily disregarded advantages of daylighting. Daylighting has been linked to elevated spirits, decreased weariness, decreased eye strain. The psychological benefit of daylighting includes satiating a craving for touch with the outside world [1]. Dr. Ott claims that, like water or food, the body uses light as a nutrient for metabolic activities. Natural light is separated into hues that are crucial to our health and it activates fundamental biological processes in the brain [2].

The difficulty to distinguish the hues of light on a cloudy day or in dim illumination might influence our mood and level of energy. Additionally, light was emphasized by Dr. Liberman as being important for preserving health: "When we speak about health, balance, and physiological regulation, we are referring to the function of the body's major health keepers - the nervous system and the endocrine system. These major control centers of the body are directly stimulated and regulated by light, to an extent far beyond what modern science…has been willing to accept" [3].

The essence of architectural design is light. We can see, locate ourselves, and learn about our surroundings thanks to light. Beyond just exposing things for us to see and touch, light models those things to improve vision and aid in the definition of the physical world. Nothing would be seen without light, which also enables us to articulate and visualize things that are invisible to the physical sight. Redefining human interactions with the world and with oneself is made easier by light. Natural light and artificial light are the two categories [4]. Nature's gift to us is natural light. A civilized man learns to employ artificial light sources, which liberates him from complete reliance on daylight. We also learn to enjoy and recognize the unique benefits of daylight. Artificial lighting is used both during the day and at night. It is human-made. If there is not enough natural light, artificial light is quite helpful.

INFLUENCE OF LIGHT

Light's wavelengths

Cool white fluorescent, incandescent, full-spectrum fluorescent, and energy-efficient fluorescent lighting are all examples of electrical light sources. Various types use different amounts of energy. However, the diverse light spectrums that each source provides have the greatest impact on building inhabitants. The effects of various spectral or wavelength ranges of light on the human body vary. Even though full-spectrum fluorescent lighting comes close to mimicking natural light in terms of spectral distribution, most electrical light sources lack it [5].

The visible light spectrum's yellow to red end is where cool white fluorescent lights are focused. Similar to incandescent bulbs, the orange to red end of the spectrum is where they are most concentrated. In contrast, the yellow to green region of the spectrum is often where energy-efficient fluorescent lighting is concentrated. The blue color spectrum, which is crucial for humans and is best delivered by natural light, is absent from these three light sources [3]. Because it emits light in the blue region of the spectrum, full-spectrum fluorescent lighting is the electrical light source whose spectrum is closest to that of natural light. In comparison to cool white or energy-saving fluorescent electrical light sources, daylight offers a superior lighting environment because it "more nearly resembles the visual reaction that, through evolution, people have evolved to compare with all other light" [6]. As sunshine has a balanced spectrum of colors, with its energy peaking somewhat in the blue-green region of the visible spectrum, most people prefer to be in daylit environments [3]. Natural light also contains the greatest levels of light required for biological processes, because the most significant portion of the photobiologic activity spectrum for humans is between 290 and 770 nanometers. Between 290 and 315 nanometers, vitamin D production and skin reddening take place [5].

Interior lighting design and types of lighting

The light beam gives beauty its meaning; otherwise in the dark, it has no use. The light, whether it is transient or mysterious, draws attention to beauty, and enhances the impact of color and other aesthetic qualities of the piece to draw attention. Hence, light debates hold a specific place in the

aesthetics. One of the disciplines and arts in which the role of light may be taken into account is architecture. This science includes a thorough discussion of how to make use of natural light. Illumination fixtures are also taken care of as artificial lighting sources. Along with other aspects and ideas like structure, space regularity, materials, color, etc., light is one of the components of architecture that is studied. Architecture is a collection of artificial elements put together in a precise and beautiful creative dance with light. Each environment has two faces, and the function that lighting plays in bridging these two faces during the day and at night is taken into consideration. Lighting has given each era's life and buildings a unique sense of meaning and purpose. Light may be utilized in a variety of ways to express distinct ideas and objectives. For instance, a particular location can be highlighted by creating a pore and directing light there, or a spiritual mood can be created by the smooth movement of light [7].

In the interior, we have three types of lighting: ambient, functional, and task. Ambient lighting that illuminates the environment in which we are is usually placed on the ceiling, but as in this view, it can also be placed in other specific places, for example next to the wall, on the floor or coming from the floor, etc. This lighting can illuminate the entire space, but with exceptions it can be set only for a certain part of the space (Figure 1). Functional lighting that is used to perform a certain function in that part; here it is shown above the dining table, which is in operation while sitting in that part, and on the other hand we have functional lighting from a lamp that is mostly used for reading (Figure 2). Task lighting is lighting that emphasizes, that is, lighting that gives emphasis to a certain part or object of the space, rather it is used as decorative lighting. In this case, we have accent lighting on a piece of art placed on the wall and a decorative tree placed on the floor, accented by a light placed on the wall (Figure 3).

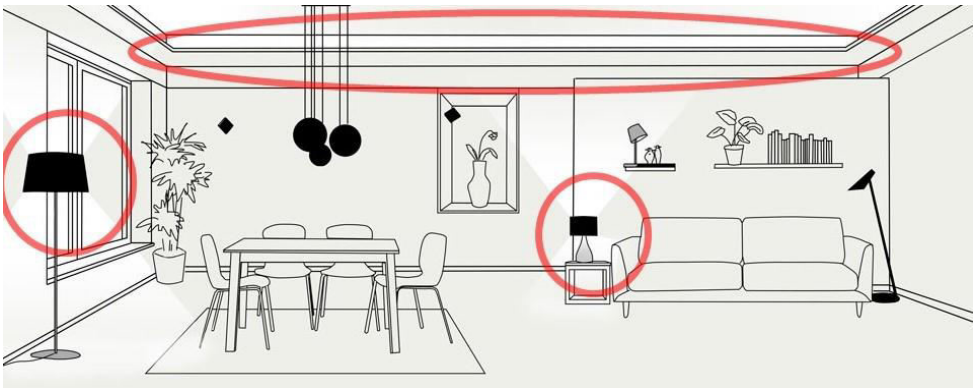

Figure 1. Ambient lighting, also called general lighting, provides full illumination for the room and aims to create a uniform level of light throughout the space.

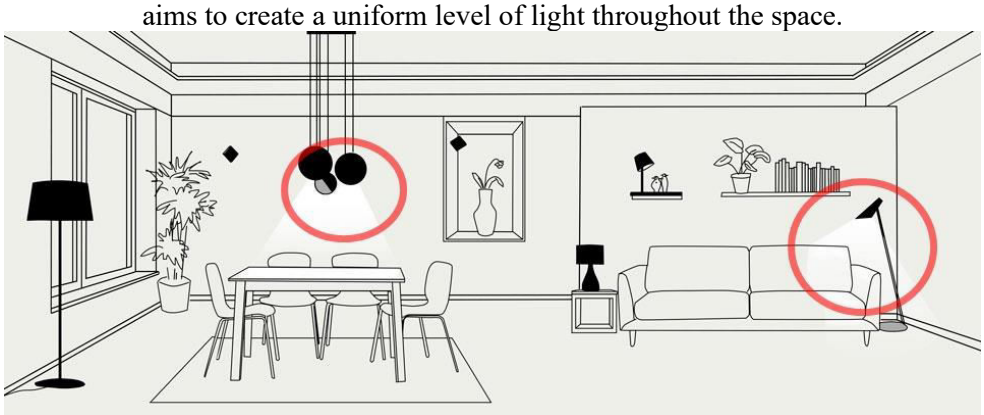

Figure 2. Functional lighting is aimed at a certain area of the room; this lighting aims to illuminate a certain area, a certain space, a certain part, or an object.

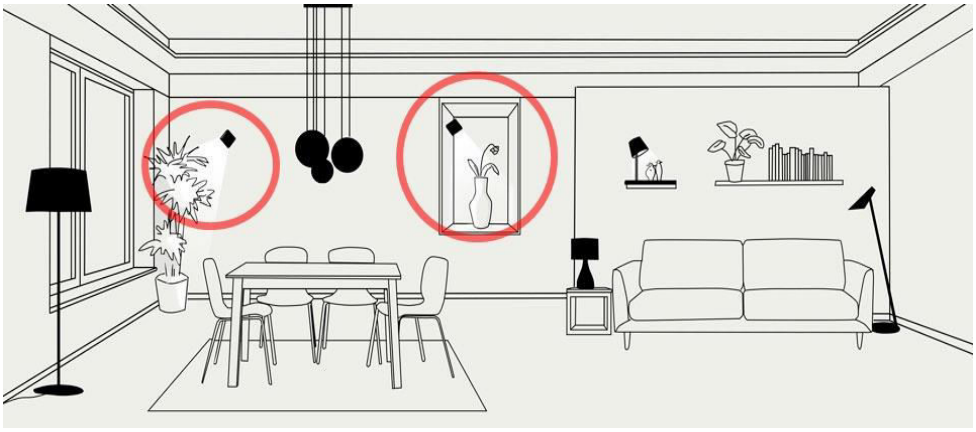

Figure 3. Task lighting also called accent lighting, draws attention to a specific object, such as artwork, sculptures, plants, or bookshelves.

Effects of light on people

Most living things are nourished by sunlight, which is a type of natural illumination. Two light-related processes that are widely understood are photosynthesis (the capacity of plants to utilize sunshine to produce food) and phototropism (the propensity of plants to grow toward light). Additionally, the effects of light on eyesight are widely known. Students' non-visual reactions to light are not fully understood. Later sections of this paper describe some of the known or hypothesized impacts of light on humans, but it is helpful to first go over the characteristics of sunshine.

A rainbow forms when sunlight pierces a raindrop. The result of sunlight traveling through a prism is the same. Despite the fact that sunlight seems to be "white" light, rainbows made by raindrops or prisms indicate that sunlight actually includes a variety of hues. The spectrum of sunlight refers to the range and intensity of various hues. The energy in sunlight that reaches the earth's surface has a wavelength between 300 nanometers (nm) and 825 nm [8]. Most of the time, the reaction to light energy with wavelengths between 400 nm and 770 nm reflected from objects is vision. Wavelengths longer than 770 nm are more easily perceived as heat, whereas wavelengths less than 400 nm belong to the UV spectrum. Natural light has several fascinating effects on both people and animals in addition to facilitating eyesight. These impacts come in both physiological and psychological varieties. These impacts' scopes are underlined in the following claim: "If the human skin is not exposed to solar radiation (direct or scattered) for long periods of time, disturbances will occur in the physiological equilibrium of the human system. The result will be functional disorders of the nervous system and a Vitamin D deficiency, a weakening of the body's defenses and an aggravation of chronic diseases" [9].

For home design, natural light is crucial for settings that meet the specified standards and have a big impact on both conscious and subconscious memory in persons. Moreover, one of the components of sunlight's ultraviolet radiation are the biological mechanisms of the body's inherent rhythm. Studies have demonstrated that environments with access to natural resources considerably improve students' and scholars' performance. The utilization of natural light has a direct impact on the quality and quantity of the standard environment, including the degree of temperature and humidity, and is very effective at conserving electrical energy [10]. In general, the quantity and quality of natural light (daylight) are considered. The quantity of daylight was disregarded by designers up until the beginning of the twentieth century and even until the middle of it, when artificial lighting was a pioneer in the field of architectural design at that time, despite the fact that the use of natural light is well known to humans from the past and architects today take advantage of it by using skylights and windows.

Since artificial and natural light are typically combined in residential settings, it is preferable to use fluorescent lamps that have a semi-direct uniform, or multiple light distribution. In this instance, it is preferable to have the rows of lights parallel to the rows of desks and teaching boards. In addition, it is vital to consider the local light shining on the teaching board [with perforated pages]. The individuals' emotions, both good and bad, were altered and amplified by the intensity of the illumination. Lighting should be considered when designing a room as soon as the space itself and its intended function are established. If you are constructing an office environment, for instance, the lighting in the workspace should promote alertness and productivity. Controls that allow for

modifications during the day should also be included. A dimmer switch would allow you to optimally control the lighting's intensity. The role of each space is important to consider when planning a home's lighting. While the living room calls for softer, warmer lighting, the kitchen, which serves as a workstation, requires brighter, higher CRI (color accurate) light. Your home's entryway should make guests feel welcome and serve as a seamless transition from the broad daylight to the inside illumination. The lighting should transition a guest from the dark outside into a warm interior light at night that will not overwhelm their senses and promote relaxation. Lighting should be reduced before bed to encourage "winding down," but should still be bright enough to allow you to securely traverse your house [with perforated pages].

Numerous studies have shown how adding natural light to our living areas has numerous advantages. According to the Architectural Lighting Magazine, daylighting, or natural light, offers the stimulation required to control human circadian cycles, or the body clock, within people. Natural light has an impact on our moods in addition to circadian cycles, and it may improve comfort and productivity in a work environment. The third-most significant criteria among statistically significant factors in raising sales volume was the presence of skylights. There is a clear correlation between schools reporting higher levels of natural illumination in the classroom and those reporting more than a 10% rise in test results. When used in a home's lighting design, natural illumination may have a similar effect. In addition to saving electricity, exposure to natural light enhances mood and facilitates sleep. Your circadian rhythm can work better if you spend most of the day in regions that are boosted by natural light, which will raise your mood and energy levels. The opposing result is directly related to over-exposure to blue light from devices in the evening.

The most crucial aspect of the design

Lighting is the most crucial factor to take into account when creating a space since it has the power to significantly impact the atmosphere of a place. Lighting may change a room's size and shape in addition to the mood of those who are in it. Painting the walls in a bright color and adding extra lighting that reflects off the walls will make a particularly small den look larger. Without intruding into the area, recessed lighting may create a subtle glow, which can make the room look larger. Designers keep using LED lighting because of its variety in brightness levels and light hues. LED technological advancements have produced a number of novel fixtures, such as LED skylights that mimic the appearance of a window and the sky. These "skylights" emit light that is the same temperature as natural light, giving the space an impression of openness and airiness and enhancing the mood of those who are within. Homeowners and designers now have a wide range of options when it comes to choosing the perfect lighting to create the ideal ambiance in their space thanks to ongoing study and innovation in the field of lighting.

RESEARCH METHODOLOGY

Case study

Residents of residential complexes with a bachelor's degree or higher were included in the target group. The Cochran formula determined that 357 respondents made up the smallest sample size.

The goal of the current study is application. In order to improve the quality of the environment for users of the space, its application proposes the emotional impacts of lighting on those users using physiological and psychological parameters. The study is "analytical-descriptive" in terms of its research design. Library and survey data collecting techniques were used. SPSS technique has also been applied. So, a questionnaire was initially created. Finally, a theory on talent was examined. The theories are as follows:

Hypothesis 1: Human behavior and perception in architectural settings are successful.

Hypothesis 2: It appears that there is a direct correlation between architectural space and natural light quality.

Discourse

As a result, indications and hypotheses were explored in this portion. The theories are as follows:

Hypothesis 1: Human behavior and perception in architectural environments seem to be easy.

Hypothesis 2: It appears that there is a direct correlation between architectural space and natural light quality.

Data analysis

The first principle is that human behavior and perception are effectively influenced by light in architectural settings. Light and sensory perception: a Pearson test relationship. It is possible to select two variables in this hypothesis that have an influence.

For instance, the first variable, human behavior and sensory perception (X), and the second variable, light (Y). We will look into the correlation between these two variables collectively to support the *first hypothesis* that we have set. In order to analyze the correlation between the data and the Pearson test, it will be assumed that the data have a normal distribution.

In this instance, the correlation coefficient is positive at 0.342. The value that promotes solidarity and is possible to prove that the amount of P (2-tailed) correlates with the correlation. Be aware that a statistical value (Sig. 2-tailed) should be used to test the hypothesis that there is a correlation. The correlation between two variables must be smaller than 0.01 in order to be accepted. Therefore, we may state that in human perception there is a favorable correlation between behavior and the use of light in home design (Table 1).

Table 1. Results of the first hypothesis test's correlation

Correlation			
		Perception and human behavior	*Light*
Perception and human behavior	Pearson correlation	1	0.342
	Sig. (2-tailed)		0.000
	N	217	217
Light	Pearson correlation	0.342	1
	Sig. (2-tailed)	0.000	
	N	217	217

To see in what way, and how much natural light affects the space that is lit, understanding the link between architectural space and the quality of natural light - Test for Pearson correlation. In this *second hypothesis*, two factors that affect the outcome can be selected. For instance, the first variable, "knowledge of architectural space," and the second, "quality of natural light," might be chosen. The second variable is the one that has an impact initially. We will look into the correlation between these two variables collectively to support the second hypothesis that we have set.

In this instance, the correlation coefficient is positive at 0.470, the solidarity-friendly value. It is possible to prove that the amount of P (2-tailed) correlates with the correlation. It should be noted that in order to evaluate the correlation between two variables, the statistical value (Sig. (2-tailed) should be less than 0.01). Therefore, we may conclude that there is a beneficial link between perception, human behavior, and interior design and lighting (Table 2).

Table 2. Results of the second hypothesis test's correlation

Correlation			
		Perception and human behavior	*Light*
Perception and human behavior	Pearson correlation	1	0.470
	Sig. (2-tailed)		0.000
	N	217	217
Light	Pearson correlation	0.470	1
	Sig. (2-tailed)	0.000	
	N	217	217

CONCLUSION

One of the most important elements that affect a residential space, as noted in the paper, is light. Proper lighting affects a person's personality and spirit in addition to providing visible light. The provision of visual comfort is one of the key design tenets for residential spaces, and this is made possible by ensuring that there is adequate lighting in the space and other surrounding areas. The benefits of suitable light in residential spaces include maintaining eye and visual health, minimizing nerve fatigue, and eventually having the intended impact on the quality of life.

There are times when lighting in a bedroom may be improved using very straightforward and useful techniques such as real reflection of the surroundings, natural and artificial lighting, and generating bright environments according to their role. As a consequence, light is one of the most effective variables in raising residential productivity, and the greatest results for the home environment may be produced through controlled light. Construction and upkeep expenses are taken into consideration while planning structures. But, since actual people will be working in these structures, care should be taken to ensure their physical and mental well-being. Employers and building owners profit from enhanced occupants' health because employees perform better.

Health, productivity, and safety of building inhabitants have all been shown to improve with properly built and maintained daylighting systems. Natural light promotes health and can treat various medical conditions. The relaxing atmosphere that natural light creates helps office workers feel less stressed. Workers' output rises as their health improves, and higher productivity brings financial rewards for employers. Additionally, pupils perform better when there is natural light. According to research conducted across, pupils attain greater exam scores than children in dimly lit classrooms with no windows or low lighting. IImproved testing scores and student health both improve when vitamin D consumption rises. Students develop and have less dental caries. Daylighting has other advantages. In a retail shop, with greater illumination, customers linger longer and personnel can recognize things more quickly.

Natural light boosts patient recovery rates in healthcare institutions. It allows seniors living in assisted living facilities to see clearly. The pleasant atmosphere benefits hospital employees in addition to the natural light. More patients will be at ease when employees are happier, and they will be more composed when a patient's recuperation has improved. There are many productivity gains because of superior color rendering and the higher caliber of light produced by natural light, in industrial settings.

Additionally, safer circumstances are made possible by improved illumination. Utilizing daylighting lowers utility bills and enhances the health of the building's inhabitants. Natural light's impacts on the building's inhabitants should be a crucial factor, because research has demonstrated the importance of the strong impact that light has on humans in various settings. Building owners and tenants can both benefit from daylighting.

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ВЛИЈАНИЕТО НА НОВИТЕ ТЕХНОЛОГИИ НА ОСВЕТЛУВАЊЕ КАКО ВАЖЕН ЕЛЕМЕНТ ВО ЕНТЕРИЕРОТ

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Резиме

Кога станува збор за реновирање на куќи, осветлувањето е важна, но понекогаш занемарена тема. Го менува начинот на кој просторот се перципира како големина, додава атмосфера и што е најважно, може да го промени како се чувствувате. Повеќе работи во добриот дизајн на осветлување отколку само да изберете стилски абажур. Всушност, дизајнот на осветлување се состои од три основни компоненти. Кога се користи правилно, амбиенталното осветлување, осветлувањето на задачите и акцентното осветлување може радикално да ја променат атмосферата на вашиот дом или работно место, правејќи го поудобно и порелаксирачко место за престој. Осветлувањето вклучува употреба на вештачки извори на светлина како светилки и светлосни тела, како и природно осветлување со снимање на дневна светлина. Дневното осветлување (со користење на прозорци, светларници или светли полици) понекогаш се користи како главен извор на светлина во текот на денот во зградите. Ова може да заштеди енергија наместо користење на вештачко осветлување, кое претставува главна компонента на потрошувачката на енергија во зградите. Правилното осветлување може да ги подобри перформансите на задачата, да го подобри изгледот на областа или да има позитивни психолошки ефекти врз патниците. Внатрешното осветлување обично се постигнува со помош на светлосни тела и е клучен дел од дизајнот на ентериерот. Осветлувањето може да биде и суштинска компонента на проектот за пејзаж.

Клучни зборови: *осветлување, внатрешен дизајн, ефекти на осветлување врз луѓето, внатрешен дизајн со природно осветлување.*