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Deanship of Scientific Research

Study Space at Home and the Role of Interior Architecture Design in a Post-Pandemic

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Abstract

Objectives: This study explored the interior design of home study areas and the impact of the pandemic on the necessity of remote learning. It highlighted principles and standards specific to designing such spaces, which are often absent or inadequately equipped in modern homes. The study aimed to demonstrate the importance of designing these spaces with pandemic implications in mind, presenting a design model to meet residents' needs. It examined the role of interior design in creating these spaces, reducing disease spread, and helping residents adapt to the pandemic's conditions. The hypothesis discussed was that appropriate study space designs can fulfill residents' needs, particularly during quarantine periods, allowing them to effectively study and maintain health and safety.

Methods: The study used descriptive, analytical, and quantitative methodologies, including a questionnaire, along with an applied approach.

Results: The study found that designing spaces suitable for pandemic conditions can meet residents' needs during quarantine and curfew. These designs allow them to study and engage in activities at home while ensuring health and safety.

ConclusionS: A proposed design model was presented, illustrating the concept of interior design for home study spaces during epidemic outbreaks.

Keywords: Interior design, home study spaces, remote learning, pandemic impact, quarantine, health and safety, design model, interior architecture.

حيزات الدراسة بالمسكن ودورتصميم العمارة الداخلية في مرحلة ما بعد الجائحة

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ملخّص

أهداف البحث: تناولت هذه الدراسة التصميم الداخلي لحيزات الدراسة في المنازل، وتأثيرات الجائحة عندما تصبح الدراسة عن بعد ضرورة. وقد تم تسليط الضوء على المبادئ والمعايير الخاصة بتصميم هذه الحيزات. حيث غياب هذه الحيزات في معظم المنازل العصرية، وحتى إن وجدت، فهي غالبا لا تكون مجهزة بشكل مناسب لتمكين السكان من الدراسة عن بعد. وسعت الدراسة إلى إظهار أهمية تصميم هذه الحيزات في ظل تداعيات الجائحة، كما قدمت الدراسة نموذج تصميم يلبي احتياجات السكان. كذلك تناولت الدراسة الدور المهم الذي يلعبه التصميم الداخلي في تصميم هذه الحيزات، والحد من انتشار الأمراض، وكيف يساعد السكان على التكيف والتعامل مع أوضاع الجائحة وتداعياتها. وتمت مناقشة الفرضية الرئيسية للدراسة، وهي أن وجود تصاميم مناسبة لحيزات الدراسة يساعد في تلبية احتياجات السكان، خاصة في أوقات الحجر الصحي، ويمكنهم من أداء دراستهم وأبحاثهم ونشاطاتهم في المنزل بأفضل شكل ممكن مع الحفاظ على سلامتهم الصحية.

منهجية البحث: اعتمدت الدراسة على المنهج الوصفي والتحليلي، إلى جانب المنهج الكمي حيث تم عمل استبيان والمنهج التطبيقي.

نتائج البحث: تم الوصول إلى العديد من النتائج، وكان من أهمها أن تصميم مساحات مناسبة لظروف الجائحة يمكن أن يلبي احتياجات السكان، خاصة خلال فترات الحجر وحظر التجول، مما يتيح لهم ممارسة أنشطة مثل الدراسة من المسكن مع الحفاظ على الصحة والسلامة.

خلاصة البحث: تم تقديم نموذج تصميم مقترح، يوضح مفهوم التصميم الداخلي لمناطق الدراسة في المسكن في أوقات انتشار الأوبئة.

الكلمات الدالة: التصميم الداخلي، مساحات الدراسة، انتشار الأوبئة

1. Introduction and Background

1.1. Introduction

Historically houses' most important job is to secure their residents and keep them safe, where the house is a shelter from bad whether circumstances, enemies and wild animals. The concept of homes developed throughout history and through civilizations, pandemics also have a role in the developing process of homes. For instance, the pandemic helped create less crowded public areas. Also, sanitation systems were created due to the spread of yellow fever, (Sumanti et al., 2023). The spread of diseases and infections led to renewing various thoughts, techniques and standards of building and designing. It also encouraged designers to design healthy living environments that are easy to sanitize and clean. Meanwhile, with the continuous spread of diseases it became vital to have a certain area dedicated for studying remotely in times of quarantine, and even as a contemporary tendency to decrease the pressure on the transportation system, and to decrease the thermotic emission, global warming and restore the environment.

Today, we live in a stage where enormous changes are happening in how we live and think, important changes in designing our houses and countries. Our homes and cities became more important than before, because all people realized and lived those periods and the critical moments where they were obliged to stay at home through the quarantine time, (El-Husseiny, 2021). So, one should ask a basic question, how will the pandemic affect the design and shape of our houses? Because in the near past, staying at home 24 hours a day for consecutive weeks in quarantine was something impossible. This signifies the drastic change that has happened and is happening in our lives. It may deepen people's understanding of the importance and necessity of good interior design of their houses, one that meets all their needs, gives them quality life and offers them the safe welfare they want, (Al-Qaisi, 2022).

As a result, for these changes, some areas at home became highly important, especially those dedicated to studying at home to make remote studies easier. Remote studying existed before the spread of virus Corona as important activities, for people who study online. But now, those activities have become more important than before. This study stresses the important role interior design plays in designing study areas at home, studying the design considerations and limitations to help the intended people in the field. The study also focuses on these areas as more than temporary corners or normal areas at the house. The research aims to clarify the importance of the interior design for study areas at home, giving a suggested designing model that meets the users' needs and desires in the shade of the pandemic ramifications.

2.1. Research Problem

The current design for most of the middle-class houses doesn't satisfy the current era needs and the pandemic ramifications, considering the quarantine circumstances, the curfew or the health safety. Especially considering the absence of the specified areas for studying remotely. And when these areas are present, they are not designed appropriately to enable their residents to practice their activities in a suitable manner to the ramifications of the pandemic.

Hence, from here stems the main research question of this study; which is, are our houses equipped in a way that enables us to study remotely and adjust with the pandemic? If not, how can we design and equip them to become up to date?

3.1. Research Aims

This study aims to improve the interior design of study spaces in homes and the implications of pandemics, to study the standards of interior design for study spaces in homes, and to present a proposed model that meets some of the contemporary requirements and needs of residents, in a way that enables us to study remotely and adapt to the pandemic, To reveal the existence of places designated for study in middle-class homes in light of the Corona pandemic.

4.1. Research Importance

The importance of study lies in its attempt to contribute to enriching the scientific content when it comes to the concept of interior design for study spaces at homes in the post-pandemic era, in addition to clarifying the challenges and design considerations that assist professionals in this field.

5.1. Research Hypothesis

The study suggests a main hypothesis, which is when creating designs appropriate for the ramifications of the pandemic, we can then meet the needs of the residents. Especially in the curfew and the quarantine. So, they can practice their studies

and research from home maintaining their health and safety. The interior design of middle-class homes does not contain suitable study places during the Corona pandemic.

6.1. Research Limitations

The research addresses the study of the interior design of study spaces in the home during the 2019 pandemic, and the preparation of a questionnaire for a purposive sample of specialists in this field from Egypt and Jordan.

2. Literature Review

1.2. Previous Studies

Previous studies: the research shed light on the previous studies to have enough knowledge in the various aspects of the topic. And know the gaps and areas not covered by previous studies to focus on it in the current study. The studies touching specific matter are very few.

The first study: for Xu, "The Impact of Epidemics on Future Residential Buildings in China" this study discusses the way diseases and viruses spread in buildings and what are the steps to be taken to lessen the danger of contagion. This study also addresses the designs of multi-layered residential buildings in the big cities in China like Beijing. Then, the study clarifies that the mentioned designs are not enough to prevent contagion and control diseases. And the study resulted in suggesting alternative solutions, not only to prevent contagion but also to enhance the sanitizing and cleaning system (Xu, 2019).

The second study: for Alessandro et al., "COVID-19 and Living space challenge. Well-being and Public Health recommendations for a healthy, safe, and sustainable housing" The study clarified that the curfew during the pandemic has changed the way people and their societies live and interact. Also, it stressed the necessity of making the buildings flexible in design, whether in the outer or the inner areas basically in houses, workplaces, public buildings and entertainment facilities. The study concluded how the concept of welfare and health are being reshaped when it comes to residential places in the future (Alessandro et al., 2020).

The third study: for Zaher **"**Design Solution for Interior Architecture post Coronavirus (COVID-19) "the study aimed at enhancing the different aspects of designing in function, environment and health. The study used descriptive analytical methodology and focused on finding designing solutions for public places to stop the spread of virus Corona. So, the study concluded the importance of using digital techniques that use the environment resources and work to face the future design and development challenges (Zaher, 2020).

The fourth study: for Zarrabi et al. **"**COVID-19 and healthy home preferences: The case of apartment residents in Tehran" this study focused on clarifying the relation between the design and healthy residence, and the changes of the social and economic lifestyle which will effect on building the interior. The research used a questionnaire on a sample of residents measuring the space, building, satisfaction self-sufficiency and the workplace. The results of this study signaled that the variables related to self-health; like the natural light, the view, the sound, and the open or nearly open horizons have special importance. Thus, the designers must focus on the self-health variables in designing the residence apartments (Zarrabi et al., 2021).

The fifth study: for Megahed & Ghoneim "Indoor Air Quality: Rethinking rules of building design strategies in post-pandemic architecture" it shed light over the effectiveness of the building designing strategies to decrease the hazards people face considering the Corona pandemic. The study showed the effect of indoor air quality (IAQ) on increasing the effect of the viruses carried by air. This study aimed to attract the attention of architects to the high risk of viruses transmitted by air, by providing the latest solutions and improvements to understand the environmental and health issues related to COVID-19 better. Due to the complexity of the problem, multiple major research are needed. This study resulted in a conceptual model that fixes the integration of engineering controls, the strategies of designing and the required air disinfection techniques to ensure indoor air quality (IAQ) (Megahed & Ghoneim, 2021).

The Sixth study: The study by Vaux & Langlais explored how individuals adapted their environments and relied on technology during COVID-19 to meet social needs. Using a mixed-methods approach, including online surveys and photo submissions, the study found that virtual environments became integrated into homes, replacing living, social, and

workspaces. It identified four key themes related to changes in interior spaces as people merged their homes with workplaces, study areas, and social spaces. The findings also provide guidance for interior designers to incorporate virtual experiences into space design. (Vaux & Langlais, 2023).

Most of the previous studies addressed the relation between the interior design and the spread of diseases on the residential areas level generally and the public outdoor areas. Here, we find the differences, gaps and variations between these studies and the study in hand, for this study focused on the study places at home in the pandemic. This study also differed in giving a suggested design depending upon the scientific standards discussed and the results of the questionnaire.

2.2. Basic Terms

1.2.2: Repercussions of Epidemics

One of the most dangerous diseases spread in the last few years is the Corona virus; a very wide-ranging viral strain that infects both humans and animals. It is well-known that several Corona viruses cause respiratory diseases in humans ranging from well-known colds to the more severe diseases like (MERS) middle east respiratory syndrome and (SARS) severe acute respiratory syndrome. Also, the new virus Corona causes COVID-19 (world H. O., 2022).

2.2.2: covid-19 disease

COVID-19 is an infectious disease caused by another virus discovered from the Corona viral strain. It was an unknown virus and disease until it was spread in Wuhan, China in December 2019. which later became a pandemic affecting many countries worldwide (world H. O., 2022).

3.2.2: Spread Of Disease and Safety

COVID-19 spreads through respiratory droplets or contact with contaminated surfaces, especially in crowded and enclosed public spaces. To prevent this, it is essential to wear face masks properly, maintain social distance, and use appropriate sanitizers and cleaners. (world H. O., 2022).

4.2.2: Sterilization and Cleaning

The importance of cleaning and sanitizing must be insured along with the house and personal cleanliness. Nonetheless, striving to find new technologies that can affect the design of our houses; these could be techniques that monitor indoor air quality, systems to filter and sanitize air and water, using materials and supplies in designing floors and surfaces that are resisting to viruses and germs, auto cleaning and sanitizing techniques that should be considered when designing, like inside the wardrobes , cupboards, and footlockers, and using developed antiviral and antibacterial fabric materials that are easy to clean, especially carpets, mattresses, curtains, and furniture’s fabrics and leathers. Also, UV-lighting devices can be used as a new technique for sanitizing, as it should be added to the lighting design to kill harmful viruses and bacteria (Rizzato, 2022).

It is necessary to clean and sanitize surfaces daily, creating smart technologies to decrease hands contact by using smart voice orders. Add to that, adequate ventilation and secluded areas that are designed for residential segregation (Zarrabi et al., 2021).

5.2.2: Home Insulation

Segregate the positively infected person from others to prevent infection, after some important steps before isolating the patient: diagnosing the patient by a physician to know if he can be treated at home, securing the house environment to be suitable for the segregation, following-up with the patient’s contacts inside the house, and providing the adequate personal preventive measures to care for the patient and to limit the disease’s spread (Ministry of Health Jordan, 2022).

6.2.2: Remote Learning

Learning and studying remotely is one of the most important alternatives that keeps the jobs going and provides services away from the academic institutes and buildings. This can be done permanently or partially where a student can contact his university electronically through smart and developed systems from home or any other place (Hedar, 2021).

3.2: Interior Design and Epidemics

The relation between disease and architecture is ancient and existed in the old cultures. Still this relation exists in our modern times for reasons related to the place and nature of disease. Medical agriculture plays a huge role in helping patients

to heal quickly and prevent the spread of disease and plagues, (Al-Qaisi, 2022). The interior design concept must give creative solutions to solve the interior areas' problems, meet people's needs and consider the health, safety and welfare of people.

1.3.2: New Spaces for New Functions

The pandemic led to increasing the importance of online shopping via the internet or phone. This study recommends the need to add new space at every house to receive the bought products, sanitize them before entering the house. This space can be created or may already exist at the entrance of the house where we find mirrors and some decorative additions. Houses can be independent energy wise, depending upon renewable natural power resources, with water recycling system and applying sustainability and self-sufficiency. These tendencies help decrease the effect of the ban ramifications, curfew, partial or total strike (Makhno, 2022).

2.3.2: Medical Architecture

Medical architecture, as you've described, emphasizes creating environments that prioritize medical standards, patient comfort, and healing. The approach aims to integrate architectural design with healthcare needs, making spaces more conducive to recovery. Alvar Aalto's work, especially the Paimio Sanatorium in Finland (1929), is a significant example of this architectural philosophy. (Colomina, 2019, p. 62-68). figure 1.

Figure 1 Paimio sanitarium building, Alvar Aalto 1929 (Colomina, 2019, p. 64).

3.3.2: Outside View & Green Areas

Due to the pandemic and having to stay at home for long periods of time, some home areas became more important like the living room. This importance must be reflected in the design in increasing the area, spaciousness and openness, having a view and natural lighting. figure 3. Also, decorating comfortable furniture helps to increase relaxation, and add more entertainment devices, communication and media at home, (Durand, et al, 2024). Figure .2

Figure 2 living room with view (Gao, 2012, p. 153).

Due to the long hours and days of the ban and quarantine inside the house, many residents would like to have a small garden or at least a balcony to spend some time in the fresh air. So, there should be more interest in green yards and plants. Thus, the study suggests finding ways and solutions where green yards are merged inside the houses, especially the small ones, and finding ways to plant vegetables at home, a way to find partial or total self-sufficiency at every house. Figure 3.

Figure 3 Green areas indoor (Gary Takle, 2012, p 181).

4.3.2: Smart Technologies & Automation

Computerizing and digitalization have an important role after the pandemic as a substitute to manual transaction and contact, that is to overcome the traditional activities and save people time and money. We are looking forward to future design solutions that are fast in response and computerized systems to defy the limitations of the pandemic whether in the existing inner areas or the early stages of designing as a precautious solution to cut off as many steps as possible that require human direct contact (Zaher, 2020).

5.3.2: Smart Bathroom

Due to the ramifications of the pandemic, it became necessary to spread smart toilets that are self-sanitizing and self-cleaning. These technologies exist already in some countries around the world, like Japan especially in the public toilets. But can these bathrooms reach our houses after the Corona ramifications? (Rizzato, 2022). figure 4.

Figure 4 Smart Bathroom, self-cleaning (roca.2022).

6,3,2: Materials and Epidemics

Prevention can be achieved using nanoscale easy to clean materials that have smooth surfaces, those surfaces lessen the friction and stickiness with water drops and oil due to the low power of the surface, so the liquids, water and oils move away from the surface. This technique can be also used in manufacturing glass, ceramic and fabric, making nanoscale painting to walls and furniture makes it easy to clean (Arafa, 2016).

The thing that distinguishes nanoscale paintings is that they are easy to clean materials, or even self-cleaning materials at times. Also, they have the quality of non-stick fingerprints, and it is anti-scratch anti-erode, moreover, there are types from it that are anti-viral and anti-bacterial.

Using nanoscale self-cleaning materials was inspired by the self-cleaning of Lotus leaves; the surface of its leaves doesn't absorb water, so that water become like drops shape on its leaves rolling down due to gravity taking with it any dirt (Arafa, 2016).

Using nanoscale materials must be activated to reduce the infection and disease spread for these materials can provide their users with health security, following the materials' health standards, their combinations and quality. Using the developed sanitary systems will secure safe and healthy interior areas (Alessandro, Daniela D. et al., 2020).

The primary statistics of COVID-19 show that according to the world health organization, the virus can survive on surfaces for hours or days, depending on variables like the surface type, temperature, surrounding humidity. So, surface material like walls and floors and furniture are essential in preventing the spread of the virus (Zarrabi et al., 2021).

Materials like anti-bacterial fabrics should be used, and floors, furniture, and paintings that are easily cleaned and sanitized. Also, the handles must be made of anti-microbes' copper, anti-fungus carpets, and anti-viral, anti-microbes' materials to cover surfaces (Ywakeem & Hedar, 2021).

Painting the surfaces with smooth non-porous anti-bacterial materials like copper, silver, bronze, copper-nickel, nickel and the like is way easier to clean and sanitize. These materials have essential characteristics that helps kill many different microscopic living creatures. Add to that the new techniques discovered and can be blended in the furniture, fabrics, and carpets to have the self-cleaning quality (Zaher, 2020).

7.3.2: Air-Purifying

The results partially support the hypothesis saying that air pollution can increase infection ability, and it's very important to filter the air from germs and viruses. COVID-19 has changed our views on sanitation and personal communication towards the environment, how to act? And what are the best strategies to deal with it? In presence of many restrictions and directions to achieve the most amount of protection against its spread through the air (Megahed & Ghoneim, 2021).

Some nanoscale materials are used inside specific machines, those qualified for filtering the air to raise its capacity and quality and filtering pollution, bacteria and germs out and recirculate it again in the inner areas (Shameh, 2019).

8.3.2: Study Spaces at Home

The home study corner is no longer a table in the corner of the living room or under the staircase. After the pandemic, study areas must be a separate room with big windows, curtains and comfortable furniture, equipped with the needed technology (Makhno, 2022). Many of the houses today are small; thus, the study area must be added considering certain standards to meet according to the users age, time of study, furniture, and needed adjustments. Figure 5.

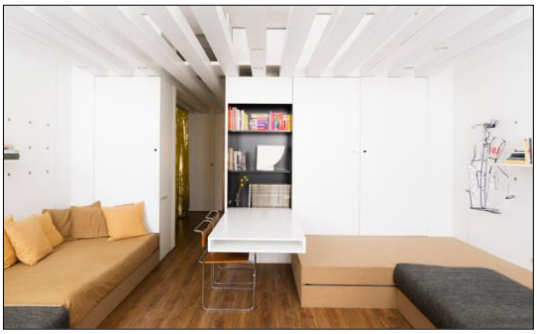

Figure 5 transforming living room to study spaces (Hedar, 2021).

Studying at home requires a soundproof of reasonable size to save files and stuff, and has the appropriate furniture with communication mediums, technological devices and perfect lighting for the virtual meetings, photography, and online exams (Zaher, 2020). figure 6.

Figure 6 technological devices in study spaces (Homedesigning, 2022).

The disease spread may change the concept and way study areas are designed, along with the progress and development of digital technology, and the development of programs, applications and the media. So, there should exist the best communication mediums and media available. (Cincinnati, 2003), Virtual and interactive environments must be reinforced through technology and the media. Decreasing the cost by providing flexible new formations, designing units, possible future designs and multi-purpose furniture. Considering the human aspects, like privacy, psychological and physical comfort and the need for natural light, considering the practical and aesthetic dimensions (Cincinnati, 2003).

The pandemic raised the feeling of concern and anxiety in some people, and to face such effect the study suggests considering merging nature into design and using like-natural colors that promotes the feelings of peace, optimism, and comfort to reinforce the inner peace in a time were physical, psychological and mental comfort highly important.

9.3,2: Privacy and Study at Home

Most of the modern houses don't have the required privacy for studying, whereas separating study corners from the rest of the house is difficult. Now, the majority tendency in designing houses is to find open and extended areas, and the economic living situation of many residents doesn't allow them to expand, adjust or redesign their house (Hedar, 2021).

The significance of creating a dedicated study area lies in establishing a clear distinction between study periods and other daily activities, such as relaxation and leisure. To ensure privacy and functionality, the study area should be equipped with ergonomically designed furniture, adequate lighting, sufficient storage solutions, and modern online learning tools. Additionally, incorporating soundproofing systems can enhance focus and minimize distractions, as illustrated in Figure 10.

To ensure privacy during remote studying, a separate area should be thoughtfully created away from the rest of the house to enhance productivity. Additionally, economic and social factors must be considered, as each household has unique financial circumstances. Therefore, smart design solutions should be economical, flexible, and adaptable to future changes., (Vaux & Langlais, 2023).

To provide privacy and multitude in activities, this study suggests dividing the house into various, independent and flexible units instead of having only one extended unit. Also, providing a separate entrance for sanitizing and taking shoes and some clothes off.

Moreover, creating a unit, a room or a wing inside the house with its utilities, to be used in case one of the family members is infected, providing a separate place for studying remotely, outdoor areas and backyard settings, if possible, to benefit from the sun and the fresh air. Taking into consideration, the flexibility of inner design through furniture and cutters, so that the design can be adjusted according to the need and the future changes, (observational a study, 2021).

3. Research Methodology:

First: The descriptive and analytical methodology was utilized, as outlined in the theoretical framework and previous studies. Research procedures included observing, monitoring, and describing the research phenomenon, gathering data and information, consulting a range of scientific references, and observing similar phenomena. This process yielded criteria used to develop the survey.

Second: The quantitative method was applied by conducting a questioner to collect the necessary data and results,

which were essential for the applied experiment.

Third: The applied method involved creating a proposed design model.

Throughout these stages, various questions were posed to derive scientific explanations, test study hypotheses, and develop conclusions and recommendations to address the research problem.

1.3: Questionnaire

1.1.3: Reviewing the Questionnaire and Its Validity

This questionnaire was revised and validated to be consistent and true in its paragraphs in connection to the axes, through showing it to a group of specialists to judge it. It was also distributed to a scoping sample, then it was circulated electronically to 120 students' sample. Cronbach's alpha coefficient has been tested along with the axes' transparency and relatedness through the SPSS program and the resilient result was 0.814 as seen in table (1) which is a high percentage, usually it shouldn't be less than 0.7.

Table 1 validity

Reliability Statistics	
Cronbach's Alpha	**N of Items**
0.814	23

2.1.3: The Community Intended in the Study Sample

The questionnaire was conducted on people who suffered the quarantine and had to study remotely from home. These people can understand the design and functional needs and requirements and the changes to be made to enhance a healthy, functional, aesthetic living environment.

The questionnaire was conducted electronically on a group of 120 university students in the BA stage, Luxor University, Egypt and Zarqa University, Jordan. The correct answers came from 81 people.

3.1.3: Analyzing the Questionnaire Results

1.3.1.3: the basic data results of the study sample: the personal data of the study sample contained some information, starting with the name, kind, college and university. Table 2 shows this part of the questionnaire.

Table 2 basic data results

Gender	Count	Percent	University	Count	Percent
male	52	64.2	zarqa	40	49.4
female	29	35.8	loxur	41	50.6
total	81	100	total	81	100

2.3.1.3: The Results of First Axis: The Nature of Remote Studying from Home in the Pandemic.

The first axis results are as in table 3.

Table 3 the first axis results

Serial	Questions	Mean	Standard Deviation	Percent	agreement Degree	Relative Ranking
1	The quarantine and curfew gave better opportunity and longer time to study.	2.46	.807	65.4	strong	3
2	Remote studying indirectly lessens emission and pollution.	2.81	.450	84	Very strong	1
3	Distance learning decreases the risks of infection.	2.59	.685	70.4	strong	2
	total	2.6	.67	71.6	strong	

The results of the first axis showed a high to very high level of agreement, indicating that the lockdown and home

quarantine provided more time and opportunities for studying. It was also found that studying indirectly reduced emission sources and environmental pollution, while minimizing the risks of epidemics and infections spreading.

3.3.1.3: The Results of Second Axis: The Study Area at Home and the Existing Design Options.

The second axis results are as in table 4.

Table 4 the second axis results

Serial	Questions	Mean	Standard Deviation	Percent	agreement Degree	Relative Ranking
1	You don't have a special separate place inside your house to study remotely.	2.78	.500	81.5	Very strong	2
2	You have a place to study at home but it's not appropriate.	2.67	.592	72.8	strong	5
3	Your study area at home doesn't foster positive studies.	2.49	.760	65.4	strong	6
4	You don't have appropriate comfortable furniture at the study area at home.	2.36	.826	58.0	strong	9
5	The existing lighting is inadequate for the nature of the study.	2.32	.849	56.8	strong	10
6	The colors used are generally inappropriate for the nature of the study.	2.37	.813	58.0	strong	8
7	The study area you have isn't supplied with sound insulation.	2.75	.582	82.7	Very strong	1
8	You don't have a view and natural ventilation in the study area.	2.65	.674	76.5	Very strong	3
9	The current design doesn't facilitate the use of technology and communication media needed to study remotely.	.267	.632	75.3	Very strong	4
10	The current used materials are hard to clean and sanitize which increases the disease spread and infection.	2.58	.610	64.2	strong	7
	total	2.3	.68	69.1	strong	

The results of the second axis (study space in the current home and available design capabilities) showed a high to very high level of agreement. It was found that 70% of the target group's homes were generally unprepared to handle epidemic conditions and required many modifications and appropriate designs to adapt to these new circumstances.

4.3.1.3: The Results of Third Axis: Study Area at Home and the Design Options.

The third axis results are as in table 5.

Table 5 the third axis results

Serial	Questions	Mean	Standard Deviation	Percent	agreement Degree	Relative Ranking
1	The design must be inspiring, stimulating, and based on a concept and idea that carefully considers both functional and aesthetic aspects.	2.89	.354	90.1	Very strong	6
2	Having a private separate space will help reinforce positive remote studying.	2.93	.307	93.8	Very strong	5
3	The furniture design must be comfortable and appropriate to the functions and needs of studies.	2.98	.222	98.8	Very strong	2
4	Having appropriate lighting helps reinforce positive remote studying.	2.99	.111	98.8	Very strong	1
5	Using neutral light colors is the best choice in the study area.	2.88	.399	90.1	Very strong	7

Serial	Questions	Mean	Standard Deviation	Percent	agreement Degree	Relative Ranking
6	The design must help decrease the outside noise providing acoustic isolation.	2.75	.582	82.7	strong	10
7	The design must facilitate the required and needed technological and communication mediums.	2.95	.269	96.3	Very strong	3
8	Having an outside view and natural ventilation are important issues at the study area.	2.94	.289	95.1	Very strong	4
9	The materials used in the design must be easy to clean and sanitize to reduce disease spread and infection.	2.85	.422	87.7	Very strong	8
10	The design can play a vital role in decreasing the spread of diseases, caring for the residents' health and safety.	2.83	.441	85.2	Very strong	9
	total	2.9	.34	91.9	Very strong	

The results of the third axis showed a high to very high level of agreement with the proposed suggestions for improving the design of study spaces in homes. These suggestions aim to meet users' needs and align with current developments.

4.1.3: The Questionnaire Axes Results' Discussion

Triple gradient Likert scale was used, the more degrees on scale the more approved and vice-versa, Table 5.

Table 6 Triple gradient Likert scale was used

Answer	agree	Neutral	disagree
Degree	3	2	1

The results haven't showed any significant statistical differences between males and females, or between Luxor University and Zarqa University from those who participated in the questionnaire. The first axis' results showed that most of the questionnaire sample assured that the quarantine and the curfew gave better opportunity and more time to study. And that remote studying indirectly decreases emission and environmental pollution, also decreases the risks of infection and disease spread. This supports the hypotheses of the study and confirms the importance of the interior design of home study areas.

The second axis results showed that a large percentage of the questionnaire participants have designing issues regarding the study areas at home, and most of them don't have a special, separate, private area at home to positively study in a fun easy way. The areas provided for most participants now are public, shared areas lacking adequate lighting, good ventilation, outside view, soundproof and appropriate furniture. Furthermore, these areas are not qualified for remote studying, they don't provide the needed facilities to use digital, technological means, flexible communication means and remote studying requirements. Add to that, most of the used materials are hard to clean and sanitize which is risky for the house residents in terms of disease spread and infection. This supports the study hypotheses and confirms the importance of the interior design for home study areas.

According to the data and results of the third axis of the questionnaire, most participants are not satisfied with the current situation of the interior design of the living environment and the study environment at home. Generally, most participants demand to enhance and develop the remote studying areas, considering it the best choice to positively enhance life and study quality, achieving the functional, environmental, healthy, technological and aesthetic requirements of remote studying. This supports the study hypotheses and confirms the importance of the interior design of the study at home areas.

2.3: The Proposed Design

Considering the pandemic's impact and current life circumstances, it became essential to rethink the interior design of residential environments, focusing on the new functional and aesthetic needs of residents. These needs were identified through the analysis of residential units' horizontal projections, based on observations and studies to improve designs. Data

was collected from remote studying students during the quarantine via a questionnaire. The results showed a need for improvements in current home designs or the creation of new designs that fit the circumstances, pandemic implications, and the growing need for online study. The aim of this study is to propose a model for interior design in home study areas that meets the current and future needs shaped by the pandemic.

1.2.3: The Purpose of the Suggested Design

Is to create a design for remote studying areas at home to apply the scientific and artistic understandings found in this research, to try and test the research hypothesis in an experimental way. Thus, providing an educational study at home environment that is practical, more comfortable, and safe. And provides precautionary measures against the spread of disease and infections.

2.2.3: The Factors Considered in the Suggested Design

An interior design for a separate study area at home was created, taking into consideration the standards addressed in the theoretical framework of the study, which were reflected in the questionnaire results: space, privacy, furniture distribution, simplicity, and the health and safety of the residents. The proposed model was designed to address the problems people faced during the quarantine, making the design applicable to both current and future buildings. The design considers the aims, priorities, function, work area, concept, and aesthetic dimension. It is intended to inspire and encourage positive activities for residents, with furniture distributed in a comfortable and appropriate manner that suits the work, technology, and communication needs. The design also provides suitable lighting to meet both functional and aesthetic needs. Neutral light colors are chosen to fit the atmosphere, with consideration given to environmental and sustainability requirements, while also providing an outside view with natural lighting and ventilation. The design aims to reduce external noise with soundproofing techniques, while ensuring the health and questionnaire of the users.

3.2.3: The Proposed Design Description

A hypothetical study area that should meet the functional and aesthetic requirements for remote at home studying. One of the areas was supposed to be 4.5 M* 4.5 M and a 2.8 M Hight inside a residential apartment for a middle-class family.

4.2.3: Working on the Proposed Design Stages

The first stage: proposing and identifying the place, territory, space dimension, basic and complementary design elements .

The second stage: placing the concept of the designing idea, where the designing thought was inspired by the concept of integration and intersession between the overall concept of knowledge and the learning process. This concept was turned into lines, territories, and designing elements that are combined and interconnected in a practical constructional way that serves the functional, aesthetic requirements. That's on the horizontal projection level and the vertical levels, in a simple direct style. This all started with a group of primary sketches.

The third stage: finding the required shape for the design using Revit 2022, a program that supports informational modeling. Through this stage the desired shape was reached after several trials and changes producing many alternative design solutions, choosing one of them depending upon the earlier mentioned criteria .

The fourth stage: specifying the overall design shape, suggesting the materials, colors, lighting style, design complements and other elements and details, keeping in mind the functional, aesthetic dimension of the design and how to be applied.

The fifth stage: the rendering process on all levels, from horizontal projection, sections to internal scenes. Figures 7 to 14 clarify the proposed model and the stages of preparing it.

Figure 7 plan sketch
(Designed and Drawn by Author).

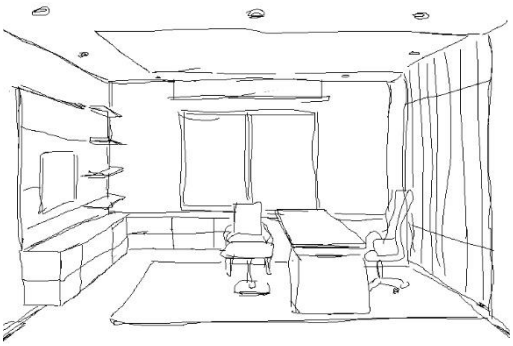

Figure 8 perspective sketch
(Designed and Drawn by Author).

Figure 9 the final plan
(Designed and Drawn by Author).

Figure 10 details from the plan
(Designed and Drawn by Author).

Figure 11 vertical section
(Designed and Drawn by Author).

Figure 12 scene 1
(Designed and Drawn by Author).

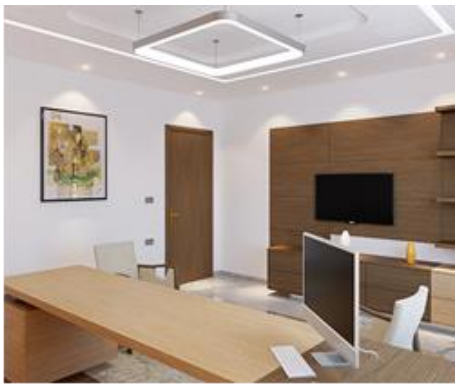

Figure 13 scene 2
(Designed and Drawn by Author).

Figure 14 furniture and details
(Designed and Drawn by Author).

5.2.3: Results Discussion of The Proposed Design

Considering the hypothesis, concepts, and procedures of this experiment, the proposed design achieved the following:

1. A design that incorporates functional standards, work area requirements, conceptual and design ideas, and aesthetic dimensions has been successfully developed.

2. The furniture was designed to be comfortable and appropriately suited to its function, communication media, and technological applications.

3. Adequate lighting was designed to meet functional needs and enhance the aesthetic dimension, with suitable colors selected based on the nature of the activities.

4. The chosen design adheres to environmental standards and sustainability requirements, providing access to an outside view.

5. A soundproofing system was integrated into the design to minimize the impact of external noise.

6. The design prioritizes the health and safety of users, aiming to reduce the spread of diseases.

Conclusion

The study reached several key conclusions, the most important being:

1. Most participants in the survey were dissatisfied with the current state of interior design in their home study areas due to various problems related to those spaces.

2. Many participants expressed a desire for improvements and developments in their home study areas, based on the design standards presented.

3. The study showed that creating designs appropriate for the pandemic's circumstances could meet residents' needs, especially during quarantine and curfew periods, allowing them to engage in activities such as studying from home while maintaining health and safety.

4. A proposed design was presented, considering design, functional standards, and work areas, as well as the concept and aesthetic dimension.

5. This study stands out from previous studies by presenting a design proposal based on the scientific standards discussed in the theoretical and the findings of the questionnaire results.

Recommendations

1. The study recommends encouraging smart, economical design solutions by creating flexible and adaptable designs that align with current life conditions and future changes, especially considering the possibility of future pandemics. Home study areas should be carefully designed to address these changes and become an integral part of modern homes.

2. Interior design should expand to provide creative solutions for interior space challenges, prioritizing people's health, safety, and well-being. Designers must focus on mental and physical health needs, considering elements like natural light, outdoor views, nature sounds, and open or semi-open horizons.

3. The study urges further research to find solutions for integrating green yards inside homes, particularly small ones, and ways to grow edible vegetables at home to achieve full or partial self-sufficiency. It calls for energy independence and water recycling systems to promote sustainability, reducing the impact of curfews, strikes, or quarantine.

Appendices of Research

Model of Questionnaire

Dear respondent, I am conducting a study on “the interior design for study areas at home and the pandemic ramifications”. This research aims to enhance study areas design at home in the pandemic. So, I would be happy if you participate and answer the following questions to reach the desired goals, with my affectionate respect.

NOTE: Your answers to the questionnaire are confidential and to be used for scientific research purposes only, and you are free to write your name or leave it anonymous.

Put • sign in front of the appropriate choice.

The answers to the paragraphs are either agree, disagree or neutral.

Name …….. Faculty …… University …….....

Male □ Female □

The first axis: the nature of remote studying from home in the pandemic.

1. The quarantine and curfew gave better opportunity and longer time to study.

2. Remote study indirectly lessens emission and pollution.

3. Studying remotely decreases the risks of infection and disease spread.

The second axis: the study area at home and the existing design options.

1. You don’t have a special separate place inside your house to study remotely.

2. You have a place to study at home but it’s not appropriate.

3. Your study area at home doesn’t foster positive studies.

4. You don’t have appropriate comfortable furniture in the study area at home.

5. The existing lighting is inadequate for the nature of the study.
6. The used colors are generally inappropriate for the nature of the study.
7. The study area you have isn't supplied with sound insulation.
8. You don't have a view or natural ventilation in the study area.
9. The current design doesn't facilitate the use of technology and communication media needed to study remotely.
10. The currently used materials are hard to clean and sanitize, which increases the disease spread and infection.

The third axis: study area at home and the desired design options.

1. The design must be inspiring, stimulating and have a concept and idea that take into account the functional and aesthetic aspects.
2. Having a private separate space will help reinforce positive remote studying.
2. The furniture design must be comfortable and appropriate for the functions.
4. Having appropriate lighting helps reinforce positive remote study.
5. Using neutral light colors is the best choice in the study area.
6. The design must help decrease the outside noise by providing acoustic isolation.
7. The design must facilitate the required and needed technology and communication.
8. Having an outside view and natural ventilation are important issues in the study area.
9. The design materials must be easy to clean and sanitize to reduce disease spread.
10. Design can play a vital role in decreasing the spread of diseases and infection, caring for the residents' health and safety.

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