

## IMPROVING THE ARCHITECTURE DESIGN STUDIO INTERNAL ENVIRONMENT AT NUB

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### ABSTRACT

Architectural education revolves around a fundamental axis, which is the architecture design studio. The learning environment, in general, affects student's creativity. Few studies dealt with the most crucial space in an architecture design course called the architecture design studio classroom. This research aims to determine the student's satisfaction degree about the architecture studio design in the department of architecture in NUB and the main variables that affect the quality of the internal environment of design. The researchers used analytical and descriptive and methods in research implementation. Research results are associated with the Architectural Design Studio only. The research community consisted of (42) students who study the Architectural Design course at Nahda University. The analysis result showed the effect of the design studio's design on the students' psyche and their level of performance. Through the study the necessity of focusing on the distribution of internal furniture in the design studio and taking into account technological developments in work by not relying only on drawing tables, but taking into account the provision of a special zone for using the computer as it became a basic tool in the architectural design process.

**KEYWORDS:** Architectural Design Studio Internal Environment, Quality, Satisfaction, Creativity, Variables

### 1. INTRODUCTION

Education has an important role in developing students' personalities and social relationships, mainly in architecture design learning, which is connected to the physical environment in many ways. Since architecture reflects society's culture in all its meanings, architectural education revolves around a fundamental axis, the design process conducted through the architectural design courses that are accomplished inside the design studio. The experience of Architecture Design Studio has emotional embroilment from users towards the physical environment, which is an important issue to study and explore. Many studies in this field focus on learning strategies more than physical environment design, affecting education quality. Design studio physical learning spaces are not rectangle boxes; on the contrary, it is an interactive environment that stimulates creativity. Issues such as insufficient natural light, movement patterns, interactive spaces, external views, green areas, plain walls, poor color can lead to ineffective physical environments affecting the psychological needs of learners [1].

Architectural education acknowledges and responds to the needs of society [2]. The architectural educational process, as a system, always needs to grow in the right and desired direction to reach the desired level of learning process outcome. The physical environment is considered an important component in the learning process [3].

The learning environment, in general, affects student's

creativity. Few studies dealt with the most crucial space in an architecture design course called the architecture design studio classroom.

A lack of data related to the design of the design-studio classroom was found [4]. Observation showed some negative effects of design studio physical environment in NUB on student's behavior such as less number of students work in the studio during sessions, lack of discussion spaces, presentation area, open spaces for break time, and interaction spaces that could bring students to gather to share knowledge and ideas which improve relationships and creativity. To determine the student's satisfaction degree about the architecture studio design in the department of architecture in NUB, it is necessary to go towards this study.

### 2. LITERATURE REVIEW

The principles of embedding should focus on the role of the design studio as the heart of the architectural education process. In contrast, the design studio can operate a large portion of the elements that affect embedding sustainability understandings in the architectural design teaching courses and spaces [5]. The architecture studio's physical environment is grounded in a relationship with the human environment and psychological needs and expectations. Physical environment and psychological dimensions are important to various needs of the learners as supportive tools of 'being there' or socially involved or acquire an emotional significance. When students are showing disappointment with the specific condition of the environment, physically or psychologically, they are unable to reach the expected level of creativity [6].

Design education requires different settings that support the learning process. The main place of architecture design course learning is the design studio. The proper interior design of the studio improves the function of the learning environment and the confidence of the students involved in the learning process. The physical environment has a direct impact on the satisfaction of the students. Learning environment internal spaces such as the classroom directly impact the well-being, academic motivation, and social relationships of the students [7]. The essential features that affect the physical environment in the design studio classroom are lighting, noise, glare, air quality, temperature, designated workstations, seat comfort, and arrangement possibilities [4]. The factors that negatively affect an indoor environment include relative humidity, clothing worn, occupants' level of activity, and mean radiant temperature [8]. Artificial and daylight inside built environment affect spaces atmosphere and visual comfort [9].

Furniture is one of the critical factors that affect the internal environment quality of architecture design studio space. Studies across many countries and time (the 1880s-2010s) conducted on the seats of the studios of architecture have proven that the drafting stool is considered to be the better seat type in the design studio, despite the lack of direct or cited studies that consider it to be the best seat type for gathering the requirements and needs of a design studio classroom [10]. For developing adaptable architectural studios, parameters and peculiar needs of students must be taken into consideration in a traditional and digital Architecture design studio as a learning environment [11]. The design studio should comprise interactive space and personal space for students. Unfortunately, the design studio classroom design focuses mainly on the cost, which leads to the office-like layout without considering the psychological factor of the students using the space. The office-like design studio's layout becomes less interactive, and it is not well suited for the nature of creativity. The most suitable design solution for a sustainable architectural design studio has three main factors that can develop students' creativity: having a transformable private and personal space, multi-functional interactive space, and livable natural setting [12].

Guerin defines the physical environment as the building envelope that contains material, design, surroundings, and systems [13]. Understanding student's experiences in the physical environment of an architecture design studio are essential. Most architectural design studios nowadays have different physical settings. The physical and the social environments contribute to student's psychological needs and expectations, such as the perception.

needs of aesthetics, outdoor views, internal and external wall's design, colors, vivid patterns and colorful displays on walls, spaces that close with green areas allows eyes to take a break from studio work and quiet areas [1]. The brain activities in a built environment showed higher stress levels while in a natural environment shown more disentangled and meditative. Using curved lines in interior design is encouraging for higher engaging brain activity

[14]. Architectural interior spaces affect users' emotional states, such as pleasure, dominance, and watchfulness [15]. Color schemes in interior spaces affect task performance and emotions [16].

Design studio built environment affects user's behavior, comfort and satisfaction and the process of learning. Special attention should be given to the built environment design of the architecture design studios spaces in terms of the physical (includes: building's envelope, site integration, and energy systems), behavioral (includes the socio-behavioral and psychological characteristics of the space (and natural aspects (include access to nature, view and natural light). Social and psychological variables are privacy, personal space, territoriality, crowding, and the safety of person, place identity and sense of place, and sense of community. Physical environment variables are anthropometrics and ergonomics, proxemics, safety and security of possessions, flexibility in use, lighting, temperature, acoustics, personalization, and control, and aesthetics. The natural environment variables are climate, resources, plants, and water [17]. Socio-educational refers to students' psychological experience of happiness, which results from the control of their mental and physical, so students, designers, and instructors should contribute through the appropriation of the classroom to achieve comfort and satisfaction [18]. Interior architectural design affects the psychological status of users; factors that describe the psychological status are identity, health concerns, privacy, safety impacts, accessibility, open spaces feature, and aesthetic sense [19].

From the review of previous studies, several factors that affect the quality of the architecture design studio internal environment can be obtained. These factors also affect students' performance, satisfaction degree, and creativity; see Figure 1 that clarifies these factors.

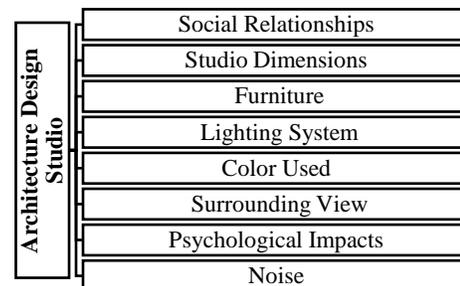


Figure 1 : Architecture design studio layout plan at NUB

### 3. ARCHITECTURE DESIGN STUDIOS IN NUB

This this research used a quantitative method to explore the factors that affect the students' creativity in the architecture design studio at NUB. These factors are mostly related to the interior design of the studio, such as the social relationships inside the studio, studio dimensions, furniture, lighting system, the color used, best view, psychological impacts, and noise.

The research focuses on studying the most important factors that affect student satisfaction and improving the design of the internal physical environment for Architecture Design Studios at Nahda University in BaniSuef, which affects the behavior, relationships, creativity, and productivity of students. As shown in Figures 1 and 2, design studios have a fixed area, 80 m<sup>2</sup>. There is a column in the middle of the space that prevents vision and divides it into four parts. Each studio is for 30 students (2.66 m<sup>2</sup>/student). The walls' color is white, and the floor's color is gray. All spaces are equipped with air conditioning, but there are no electrical installations that support computers in design studios.

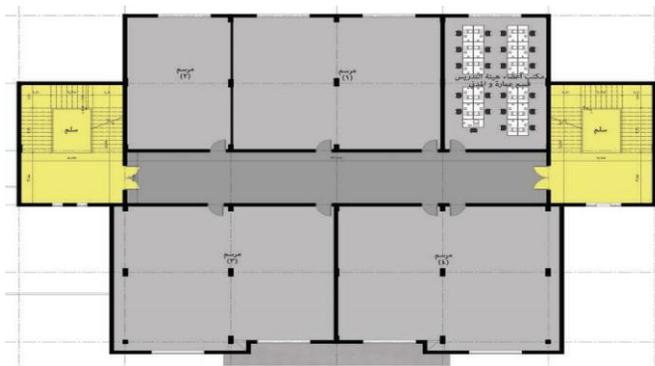
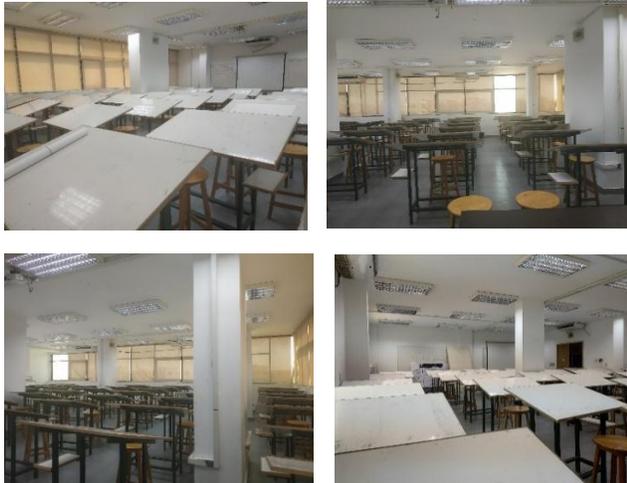


Figure 2: Architecture Design Studio at NUB

Figure 3: Architecture design studio layout plan at NUB

It is a traditional space furnished with fixed-angle drawing tables and circular drafting stool wooden chairs. The windows of the Design studio halls are sealed and covered with curtains that do not open due to the sun and the bad outside views. Figures 2 and 3 show the design of the architecture studio at NUB.

#### 4. INTELLECTION OF THE RESEARCH PROBLEM

The sense of the research problem stemmed from several matters, namely: (1) The problem results from students' constant complaints about the design of design studios, the area, the colors of the walls, the services available in it, the quality of the furnishings used, as well as the bad views of the halls, and the presence of columns in the middle of the halls, etc.. (2) The lack of a clear reference guide for designing the design studio halls in light of the development in technology and updated modern teaching methods to raise the quality of architecture education. (3) The researcher worked as a faculty member in the College of Engineering, Architectural Department, and taught an architectural design course. (4) Through extrapolation of some studies that stated that the quality of the internal environment of the design studio affects student's productivity and raises the positive impact on the student's psychology. So it was necessary to go towards the application of this research to determine the student's satisfaction degree about the architecture studio design in the department of architecture in NUB. The current research problem is determined by answering the following questions: "What are the main variables that affect the quality of the internal environment of design."

#### 5. RESEARCH METHODOLOGY

To reach the study's aims, the researcher used the descriptive and analytical approach in research implementation, as it is the most appropriate approach type suitable for this research. Because it depends on the description of the reality or phenomenon as it exists, its analysis, and the statement of the relationship between its components and the opinions that are raised about it, this study adopts an inductive methodology [22]. It starts with a problem definition then a desk study to explore factors that affect student's productivity, creativity, and satisfaction in architecture design studios from previous studies. Then the study progressed into a survey (questionnaire) to diagnose user's opinions (students) in a specific case study (architecture design studios at NUB). Results revealed a specific description of the real situation, which was taken into consideration to develop an approach with viable solutions and guidelines.

The first part of this study consists of a theoretical approach to detection and investigation factors that affect ideal studio design from previous studies to develop the study tool. The second part includes applying the research tool to a case study (architecture design studios at NUB) to test the views on the architecture design studios' interior design in light of the factors and variables derived from previous studies from students' viewpoints. This will help better address the case study with its precise nature and particular circumstances, which describe and examine the real case to suggest solutions and guide the design process for this kind of use. This would be essential in formulation strategies and guidelines for design studios' interior designers.

##### 5.1. Study Limits and Community

Research results are associated with the Architectural Design Studio only. The research community consisted of all (42) students of the Architecture Department who study the Architectural Design course at Nahda University. The following Table 1 shows the distribution of the research sample according to the research variables.

**Table 1: Characteristics of the Demographic Sample**

Variables	Alternatives	Number	Percentage
Gender	Male	15	36%
	Female	27	64%
Total		42	100%
Studying Level	Third	14	33%
	Fourth	20	48%
	Fifth	8	19%
Total		42	100%
Way to present the work	Manual	8	19%
	computerized	34	81%
Total		42	100%

**5.2. Preparation of the Research Tool (Questionnaire)**

In light of the review of the educational morals and previous studies related to architecture studio interior design, the research tool (the questionnaire) was constructed, which consisted of (42) variables divided into eight groups, and the answer to the variable gradation from the answer (Totally agree) to the answers (agree), (Don't know), (Disagree), to the answer (Totally disagree) on the five scales. The eight groups of variables are the social relationships inside the studio, studio dimensions, furniture, lighting system, the color used, surrounding view, psychological impacts, and noise.

The validity of the research tool was verified by presenting it to a group of specialized referees, who made some observations and opinions about the validity of the scale in studying the internal environment of the architecture design studio and their effectiveness in supporting students' productivity from the point of view of the architecture engineering students, they indicated the validity and suitability of his statements for this purpose.

After collecting the research data, the researcher converted the verbal answers into digital. The necessary data statistical processing was done by extracting numbers, percentages using a computer using the SPSS statistical packages program.

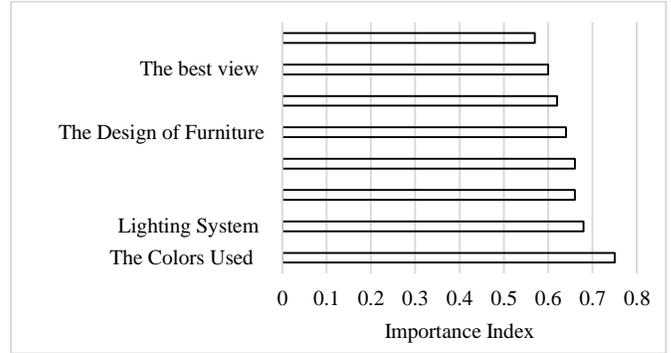
Relative Importance Index, RII, given below, is used to rank variables within groups [20]:

$$RII = \frac{\text{The summation of the total point score}}{5 \times N} \quad (1)$$

The value of RII ranges from 0 to 1, that is  $0 \leq RII \leq 1$ . RII is used because it fits the purpose of comparing different variables [21].

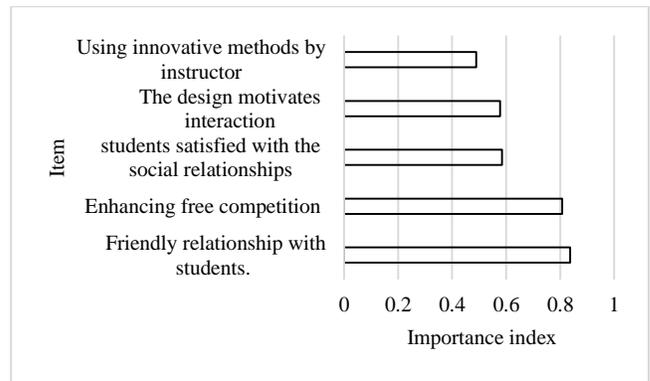
**6. FINDINGS AND DISCUSSION**

The questionnaire was studied by analyzing its parts, finding the arithmetic mean of it, and the color section has the highest value Relative Importance Index of 75%, followed by the lighting section with arithmetic mean value of 68%. The part of the dimensions of the design studio and the surrounding view has the least significant factor, which is 57% and 60%, respectively, as shown in Figure 4.



**Figure 4: Ranking of factors affecting the design of architectural studio at NUB**

Regarding the analysis of social relations between students, which is the first part of the questionnaire, the analysis results showed that the students strongly believe in the need to strengthen social relations and cooperation among them, with a Relative Importance Index of 84%. Also, the analysis results showed that the design studios in the Department of Architecture at the NUB do not stimulate the use of creative methods in teaching by the instructor, nor does it encourage creative interaction between students. The students expressed their medium satisfaction with design studios' design, as this item received a Relative Importance Index of 59%, as shown in Figure5.



**Figure 5: The results of social relationships analysis inside the architectural studio**

The second part of the questionnaire discussed the importance of the design studio's dimensions in the design to stimulate creativity among students. The students indicated that the most important item in this part is the necessity of the suitability of studio dimensions and its area to accommodate the number of students, and this item received a Relative Importance Index of 71%. The analysis results indicated that the students are not satisfied with the

studio design's external shape. This item received a Relative Importance Index of 47%, and the results of the analysis also indicated that the students did not feel comfortable doing their work inside the design studio. This item got a low Relative Importance Index value of 51%. The analysis results also showed that students prefer to work in a studio with regular dimensions rather than non-regular ones. As shown in Figure 6.

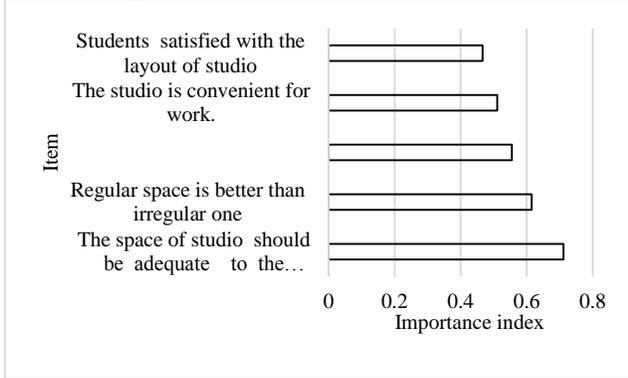


Figure6: The results of the dimensions analysis inside the architectural studio at NUB

The third part of the questionnaire discusses the importance of the furniture design and its shape in improving the internal environment of the design studio at Al-Nahda University from the students' point of view. A large percentage of the students indicated the need to gather the design studios into groups with an importance factor of 73%, and the analysis also showed the students' support to use durable and environmentally friendly materials. The analysis results also showed the students' dissatisfaction with the furniture in the design studios and this was shown with a Relative Importance Index of 47%, and this is because the truth that the drawing tables used are fixed in height and fixed angles so that students cannot control their height or angle of inclination according to their height or physical condition. Therefore they find it uncomfortable, as shown in Figure 7.

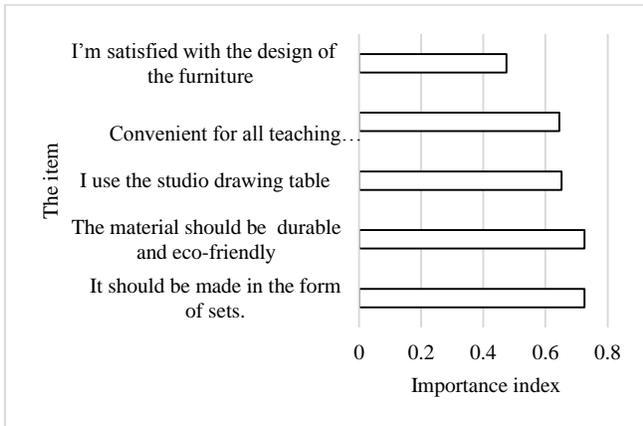


Figure 7: The results of the furniture analysis inside the architectural studio

The internal lighting and its role in improving the internal environment of the design studio were discussed

from the students' point of view, and it was found out of the analysis that students consider the natural and industrial lighting to be sufficient with a high percentage, as this sentence obtained the highest Relative Importance Index of 73%. The analysis also showed that students do not prefer unicolor lighting in the design studio, with a Relative Importance Index of a small value of 54%. This is because of their belief that non-unicolor lighting stimulates are more creative. The questionnaire results showed that students are medium satisfied with the lighting in the design studios, which is due to the appropriate proportion of brightness and the unicolor lighting, as shown in Figure 8.

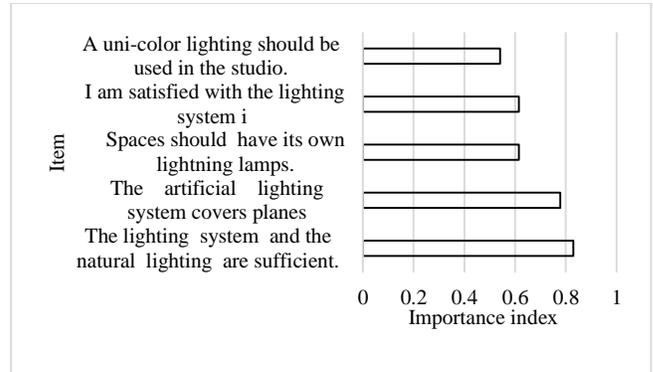


Figure8: The results of the lighting analysis inside the architectural studio

The fifth part deals with studying the importance of colors in improving the internal environment and stimulating creativity. The analysis result of this part indicated that the students consider the necessity to select colors for the design studio as a matter of great importance, and this item got an indicator of Importance Index of 73%. For them, they also indicated that colors should be comfortable in the interior design of the design studio, and the analysis result indicated the students' lack of interest in using multiple colors in the interior design of the studio and the general result of this item indicated the dissatisfaction with the colors inside the design studio and this was evident when this item received an indicator of Importance Index of the value 37%.

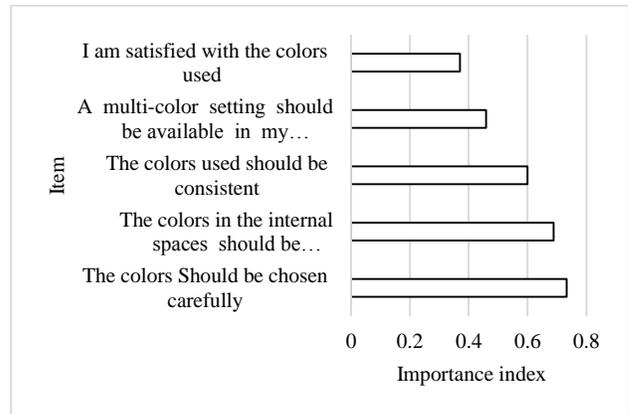


Figure9: The results of the colors analysis inside the architectural studio

The sixth part dealt with the study of the importance of the design studio view for the students, which also showed the student's dissatisfaction with the design studio view with an indicator of Importance Index of 46%, and this could be due to the view of the design studio on the cemeteries as shown in Figure 10. Most of the students preferred to have a view of the design studio on green open spaces because that makes them feel comfortable during work and that by obtaining this point on the highest value of the significance indicator, which reached 70%, as well as the students' preference of using natural lighting and ventilation, and that is why this item got 67%.

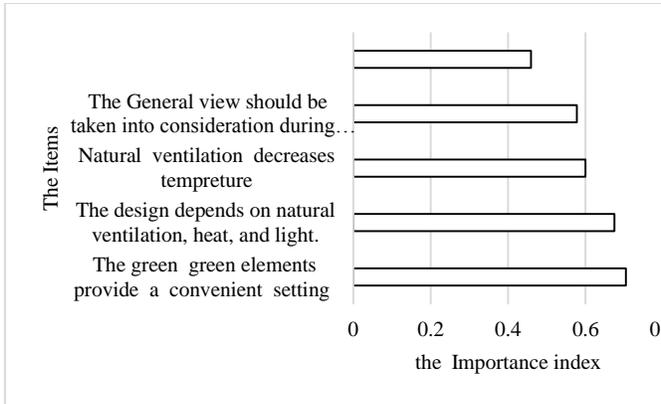


Figure 10: The results of the external view analysis inside the architectural studio

The students were also asked about the psychological impact of the internal environment of the design studio on them during work. The analysis results shown in Figure 11 indicated their views of the students' preference to listen to sounds or music during work in the first degree, which stimulates their creativity, and this item obtained the highest indicator of Importance Index of 80%. Students also prefer to see posters of famous architects, which stimulate their creativity, and in general, students are dissatisfied with their psychological return through their work inside the design studio in the Department of Architecture at Al-Nahda University. Figure 11 shows the decreasing order of the various items according to the indicator of Importance Index from the most significant to the least significant..

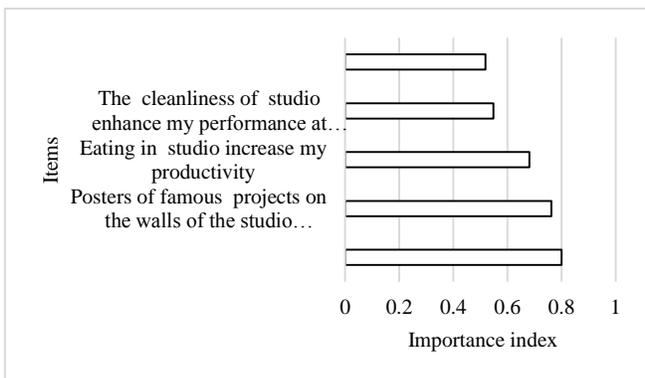


Figure11: The results of the psychological impacts analysis inside the architectural studio

The last part of the questionnaire discusses the importance of the noise effect on work inside the design studio. The analysis result that appears in Figure 12 indicated the need to avoid dispersion resulting from the noise in the design studio with a Relative Importance Index of 81%. The students also indicated through the questionnaire analysis the result to their medium satisfaction with the size, shape and location of the windows, and the analysis results also indicated that students suffer from inconvenience in the design studio resulting from the students' voices, due to the lack of sound-absorbing materials in the studio, and the following figure shows the arrangement of items according to the Relative Importance Index from most significant to least.

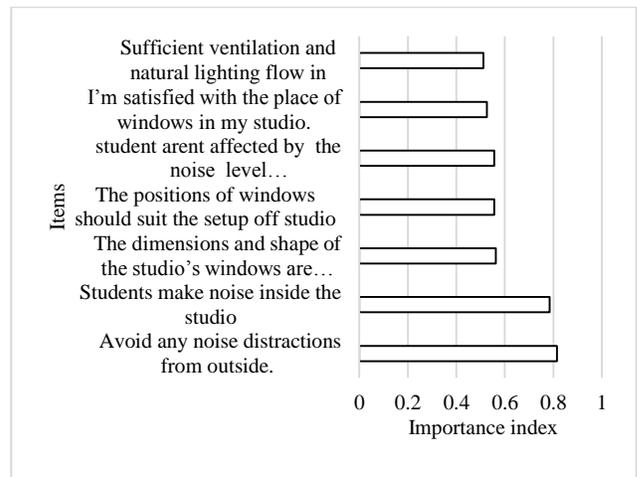


Figure12. The results of the noise analysis inside the architectural studio

Many interviews were conducted with Architecture Engineering Students. They were asked about their vision to improve the Design Studio internal environment; students expressed a set of suggestions that can be summarized as follows: (1) Replacing chairs and drawing tables with more comfortable ones. (2) Providing hardware for architectural programs within the architectural design studios. (3) Redesigning the design studio and adding landscape elements inside and outside the studio. (4) Providing places to work on computers, not just for hand drawing inside the studio. (5) Dividing the studio into various and different work areas. (6) Removing the columns in the center of the studio to provide visibility to all students. (7) Diversify the colors of the walls and the furniture.

## 7. CONCLUSIONS

Results emphasized how the design studio's physical environment affects human relationships and psychological needs. Through this study, a set of results was reached. The most important of them is the need to link the level of students' creativity with the educational environment and find a relationship between them that affects the interior design of architectural design studios. And also, the analysis result showed the effect of the design studio's design on the students' psyche and their level of performance, which can be taken into consideration during the design process.

Through the study the necessity of focusing on the distribution of internal furniture in the design studio and taking into account technological developments in work by not relying only on drawing tables, but taking into account the provision of a special zone for using the computer as it became a basic tool in the architectural design process. Thus not relying on the traditional furniture of the design studio, the results also showed that positive interaction is important for the vast majority of students. Therefore it is important in the level of achievement and the educational process, which should be encouraged through the studio's design. The results also focused on the students' tendency to rely on natural lighting and ventilation and their importance in motivating them to work. This indicates the need to mostly integrate the environment and environmental factors in interior design. For students, the environmental, social, and psychological factors are the most important in improving their illumination level to work inside the studio, which must be the basis and must be taken into account in the design process inside the designing studios.

The statistical analysis indicates the degree of architecture student's satisfaction on the existing eight factors of the physical environment, which leads to finding the guide that will bind the results together to develop effective qualitative outcomes. Student's satisfaction degrees on all items are moderate. Many conclusions can be reached from the results and the interviews with students related to the design studio design. They can be summarized as follows: (1) The design studio's internal environment should be more than a classroom in the shape of a box to inspire students to work and relax during work when students feel stuck with concepts. They need to eat and drink during the long working hours; they need areas for relaxing, areas for interaction and discussion, model making zone, adequate furniture, views more than walls, coffee corner, laptops corner with appropriate installations. (2) The location of design studio near to external landscape and activities area; students need to take a break from thinking during work and not to feel isolated, most of the students preferred to have a view of the design studio on green open spaces because that makes them feel comfortable during work. (3) Students need adequate space to complete their work without feeling isolated or to achieve privacy. (4) Students prefer to distribute the furniture inside the studio into smaller groups. (5) Colors should be comfortable and motivate students to work; students do not prefer neutral colors or using only one color inside the studio. (6) The architectural design studio should contain elements to promote creativity among students, as posters of the pioneers of architecture in the world and their famous works.

## 8. RECOMMENDATIONS

One of the most important recommendations of the research is to recommend design guidelines that help to improve effective architecture studio depending on many items such as studio dimensions, furniture, lighting system, the color used, surrounding view, spaces, and elements that provide psychological support and reinforce social bonds

and participations and noise processing. Because when users showing moderate satisfaction, physically or psychologically, with the design studio's physical environment, there is a tendency to search for a favorable place—the need to form a committee to review the design of all architectural design studios. And lay down some basis and appropriate requirements that are approved for the era to design these spaces and considering it an essential element of the quality of the educational process to reach the optimal performance of students.

## Conflict of Interest

The authors declare no conflict of interest.

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#### Abbreviation and symbols

NUB	Nahda University at Benisuif
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### تحسين البيئة الداخلية لاستوديو التصميم المعماري في جامعة النهضة

يناقش البحث موضوع التصميم الداخلي للبيئة الفيزيائية التي يتم فيها تدريس مقرر التصميم المعماري وهو استوديو التصميم المعماري داخل اقسام العمارة ، وترجع اهمية البحث في ندرة الأبحاث العلمية التي تناولت اثر التصميم الداخلي للمرسم على تحفيز ابداع الطلبة، وتم تطبيق الدراسة على طلاب قسم العمارة في كلية الهندسة بجامعة النهضة – مصر ، واستخدم فيه استبيان بحوي ثمانية محاور أساسية يتفرع من كل منها مجموعة متغيرات ، المحاور الرئيسية تتمثل في الجانب الاجتماعي وابعاد الأستوديو والفرش الداخلي والإضاءة المستخدمة والألوان والاطلالة المحيطة والتأثيرات النفسية والضوضاء.وبعد تحليل الدراسة تبعا للمنهجية المتبعه في البحث تم التوصل لمجموعة من النتائج أهمها التاكيد على تأثير البيئة الفيزيائية على نفسية الطلاب ومستوى أدائهم مع ضرورة دراسة توزيع الفرش الداخلي بشكل ملائم مع توفير منطقة خاصة باستخدام الكمبيوتر ، كما ان الطلاب يفضلون كل من التهوية والإضاءة الطبيعية و الاطلالة و الالوان.