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ARCHITECTURAL EDUCATION ENVIRONMENTS: WHERE TEACHING ENDS AND LEARNING BEGINS

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Abstract

Architecture is a fast changing domain. Nevertheless, architectural education in Egypt can often not keep pace with those fast changes. Namely, graduate students start to realize that there are practical experiences like dealing with clients, working in large teams and acquiring knowledge related to architectural software independently which they do not obtain in undergraduate years, but wish that they did! This raises the question of how far should the architecture educational process change from Teaching to Learning ?As a matter of fact, the educational process at any architectural department is defined to a very high extent by the physical attributes of the department's spaces. Educational environments created by both, the physical interior and the educational method are assumed to be responsible for students completely adhering to academic content and not being able to acquire new knowledge independently, innovate and develop the necessary work competencies. Therefore, the department of architecture at the Faculty of Engineering (University of Alexandria) is taken as a study case. A questionnaire among fresh graduate students is carried out to obtain feedback concerning the education provided. Meanwhile, a field survey is conducted to assess the most important key features of the department's physical space which affect the educational process as revealed through literature review. Finally the paper compares survey findings with questionnaire results and recommends a set of physical and educational changes to be made in order for shifting the educational process to be more learning-oriented at the department subjected to study.

Keywords

Architecture, education, teaching, learning, design

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ABSTRACT

Architecture is a fast changing domain. Nevertheless, architectural education in Egypt can often not keep pace with those fast changes. Namely, graduate students start to realize that there are practical experiences like dealing with clients, working in large teams and acquiring knowledge related to architectural software independently which they do not obtain in undergraduate years, but wish that they did!

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Therefore, the department of architecture at the Faculty of Engineering (University of Alexandria) is taken as a study case. A questionnaire among fresh graduate students is carried out to obtain feedback concerning the education provided. Meanwhile, a field survey is conducted to assess the most important key features of the department's physical space which affect the educational process as revealed through literature review.

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1. INTRODUCTION

Despite the fact that rapid technological developments are continuously changing the architectural practice worldwide, on the academic level in Egypt architectural education does not respond as quickly to these changes. This results in a steadily increasing gap between the academic content provided and the "After Graduation Job Reality". Fresh graduates start to realize the urgent need to develop practical skills never acquired in university but highly important for architectural practice; interview confidence, negotiation techniques with clients and on-situ proficiency are only a few to mention. And according to (Saghafi, Franz, & Crowther, 2012), it is due to the absence of innovative and flexible pedagogical models that the education of architecture is not responding to technological changes as quickly and effectively as it should. Furthermore, the physical environment of architecture departments plays a crucial role in supporting the development of new,

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flexible and learner-centered educational models. Thus, this paper aims at discovering the level of incompetency in practical skills among fresh graduates and tries to find reasons therefore in their pre-graduation educational environment physically and pedagogically in order to conclude necessary changes to be made for improvement.

2. METHODOLOGY

This is a correlational research paper which aims at examining the strength of relation between the physical and pedagogical attributes of educational environments on the one hand and the level of practical experience acquired by students upon graduation on the other hand.

Therefore a survey questionnaire among fresh graduate students is employed to investigate their feedback on the "practical" education provided to them during their study at the Department of Architecture in Alexandria University's Faculty of Engineering. Simultaneously, an observational field survey is conducted to register the physical attributes of the department's educational spaces. Here, the distinction between "formal" and "informal" educational spaces is pointed out. For, (Pera Vieira & Krüger, 2015) make reference to (Bernstein, 1973) and his pedagogical theory of knowledge transmission and acquisition patterns and argue that learning must be understood as a decentralized process that can occur anytime and everywhere. Therefore, (Pera Vieira & Krüger, 2015) place importance on "informal" educational spaces where temporary learning events and informal knowledge sharing can take place beyond official classroom or design studio schedules. Furthermore, special attention is paid during the observational field survey to available technological and multimedia devices in studios and classrooms, their condition, and their usage intensity. Namely, (Molnar Ph.D., 2007) emphasizes the importance of using multimedia in education for increasing students' productivity and knowledge retention rates.

Next, field survey as well as questionnaire outcomes are stored in a Microsoft Access database for ease of informative data presentation through Microsoft Access queries as well as Microsoft Excel charts. Accordingly, the results of questionnaire and field survey are analyzed in order to assess the strength of relationship between the physical and pedagogic attributes of the department and the "practical proficiency" of fresh graduates.

Finally, a set of necessary changes to both physical and pedagogical environment are recommended in order to achieve a fast shift to an academic architecture education that is more learning rather than teaching-oriented.

3. SCHOOLS FOR LEARNING ARCHITECTURE

This section of the paper is concerned with presenting the most important findings of literature review carried out on the topic of trending architectural school environments - on both, physical and pedagogical level - as well as the impact of educational space on students learning method. In fact, all reviewed references have shown that it has become impossible to neglect technological changes affecting today's world in education in general and in architectural studios in a special manner, whereby upgrading existing traditional pedagogical models has been made inevitable.

3.1 New Pedagogical Concepts

As (Osborne, Design studio terrains : Mapping the learning landscapes of Australian architectural education, 2015) states, "diversification and expansion of global higher education in the 21st century has resulted in learning landscapes for architectural education that can no longer be sustained by the traditional model". She continues to highlight the importance of bridging the gap between academic theory and actual practice of architecture and states the significance of transforming architectural design studios into "Active Learning Environments" which are capable of supporting collaborative connected learning models. This has been closely examined by (Saghafi, Franz, & Crowther, 2012) in a comparison between traditional architectural studio educational models and what is called "Holistic Blended Design Studio Model". The comparison of (Saghafi, Franz, & Crowther, 2012) was drawn between two main types of design studio modes: "the synchronous design studio mode" and "the asynchronous

design studio mode". Each of both modes is further subdivided into two subcategories, namely "on university campus" and "off-campus". "Synchronous on-campus" architectural design studios represent the traditional architectural education method, whereas "asynchronous" design studios require integration of today's information communication technology (ICT) in the daily design studio routine and allow hereby for more flexibility in terms of place of education. Through implementation of real-time web conferencing tools like "Elluminate Live" a "synchronous" off-campus design studio mode can be achieved allowing for collaboration between students, professors and architects from all over the world in real-time. Meanwhile, shifting design projects' progress review to be off-studio through online social networks like facebook , the studio experience is no longer restricted on the physical architectural departments' spaces, nor is it limited on officially scheduled studio hours, thus providing for an "asynchronous" off-campus architectural studio mode. Finally, integrating extra-curricular design events to take place on-campus but in "informal" educational spaces represents what is called "asynchronous" on-campus architecture educational studios.

The comparison lead to the conclusion that each of the four "modes" has advantages as well as disadvantages and that none of the four can solely be applied if ideal results are expected. Consequently, (Saghafi, Franz, & Crowther, 2012) recommend a "Holistic Blended Design Studio" that incorporates features of all of the four studied studio types with the aim to reach best level of communication to support collaborative learning with no waste of time through employing available ICT while maintaining the strength of human interaction, authenticity and increased motivation and positive competition guaranteed through traditional architectural education method.

Another aspect highlighted by (Molnar Ph.D., 2007) is the importance of collaborative learning in today's educational environments and the necessity for physical educational spaces to be more learning-fostering , to allow for mobility and flexibility and to provide a home-like atmosphere while being able to integrate the latest multimedia tools which - in their turn - increase learning abilities of students and enhance the educational process.

Collaborative learning has also been proved as a very effective and highly significant quality in architectural education by (Osborne, Franz, Davis, O'Gorman, Ellis, & Caldwell, 2015). Through conducting an experimental collaborative real-world design project (Osborne, Franz, Davis, O'Gorman, Ellis, & Caldwell, 2015) were able to reveal five aspects of collaboration which have shown obvious positive impact on third year students learning experience.

1. Tangible and Real-world Design Outcomes stimulate the will among students to create high quality work.
2. Working with a real client helps students develop the necessary communication skills for architectural practice.
3. Interaction with a real client's design expectations and eventual changes gives the students the opportunity to learn how to be flexible in their design proposals.
4. Working in multi-disciplinary teams gives the students an insight of how various fields influence the design process and how different disciplines progress through the various project's phases.
5. Direct contact and discussions with a real-world client helps students develop an understanding of how their design decisions affect the prospective user's usage of the building on a daily basis.

3.2 New Physical Environments

This requires upgrading architectural schools' inventory to match these functional changes like shown in a detailed description in (Molnar Ph.D., 2007). Here, criteria defining 21st century classrooms are explained through describing the whole process of turning a traditional classroom into an up-to-date, technology-tolerant and flexible classroom.

(Molnar Ph.D., 2007) highlights the importance of using multimedia in education due to their positive impact on increasing productivity and students retention rates of acquired

knowledge. And she sums up the necessary physical changes for upgrading traditional education spaces into the following five concrete points:

1.Necessary Electric Wiring
2.Color Choice for walls, floors and furniture
3.Mobile Furniture
4.Interactive White Boards and traditional White Boards
5.Wireless Technology and Multimedia

Yet, informal spaces in architectural schools play a very important role in stimulating socialization and constructive interaction between students enrolled at the same architectural school but not necessarily at the same year. And this, as accentuated in (Pera Vieira & Krüger, 2015), establishes a new frame of "informal learning spaces where social interactions promote learning developments". (Pera Vieira & Krüger, 2015) understand gathering spaces, atriums, terraces and even corridors and hallways as "spaces for informal learning activities and temporary learning events".

4. FIELD SURVEY

This paper is based on an observational field survey to register and assess the physical characteristics of the Department of Architectural Engineering in Alexandria University's Faculty of Engineering which are found to have direct impact on the type and quality of the educational process and its ability to develop into a more up-to-date mechanism.

For this purpose, the officially produced architectural drawings of the department were procured from the Engineering Center of Alexandria University.

4.1 Field Survey Parameters

Based on these official AutoCAD drawings, a Microsoft Access database was produced containing the key parameters of the department's physical space subjected to study. Through repeated walk through observation , photographing and measuring the database was completed. The database is composed of following parameters:

1. Space Use
2. Educational Type
3. Usage Intensity
4. Area
5. Number of Users
6. Area per User
7. Projector , LED screen and Wi-Fi Availability
8. Furniture Characteristics
9. Pin Boards Availability
10. White Boards Availability

Figure (1), (2) and (3) illustrate the main use categories of the department's spaces in the three respective floors constituting the department.

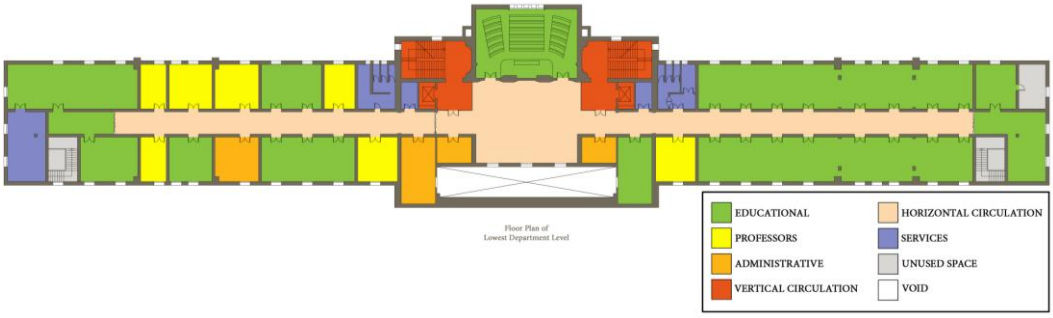

Fig. 1 Lowest Floor Level Space Use
Reference: Produced by author

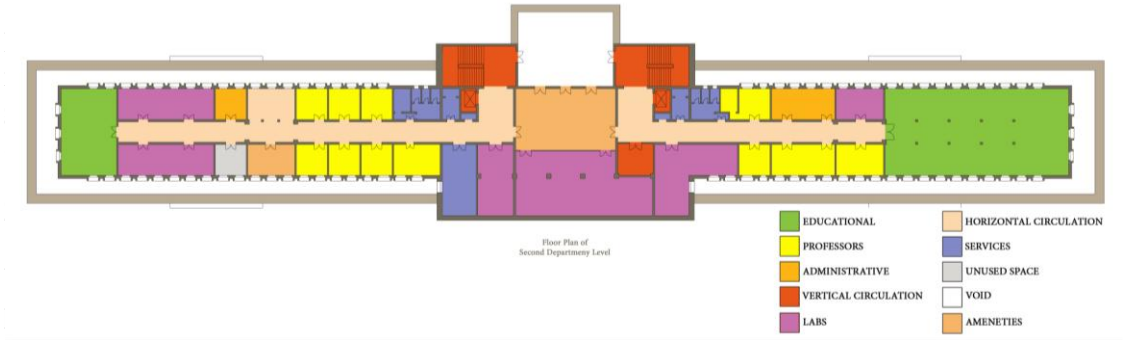

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Fig. 2 Upper Floor Level Space Use
Reference: Produced by author

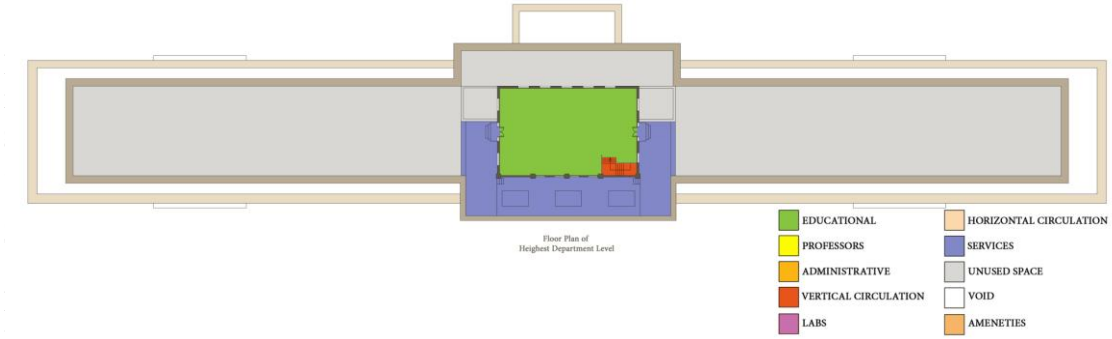

Fig. 3 Highest Floor Level Space Use
Reference: Produced by author

4.2 Field Survey Findings

Analysis of the Access Database Records has shown that the department incorporates a total of 1877 m^2 of educational space out of which 1468 m^2 are used for formal education and 408 m^2 are used for informal education. Nevertheless, Fig. 4 shows that the usage intensity of formal education

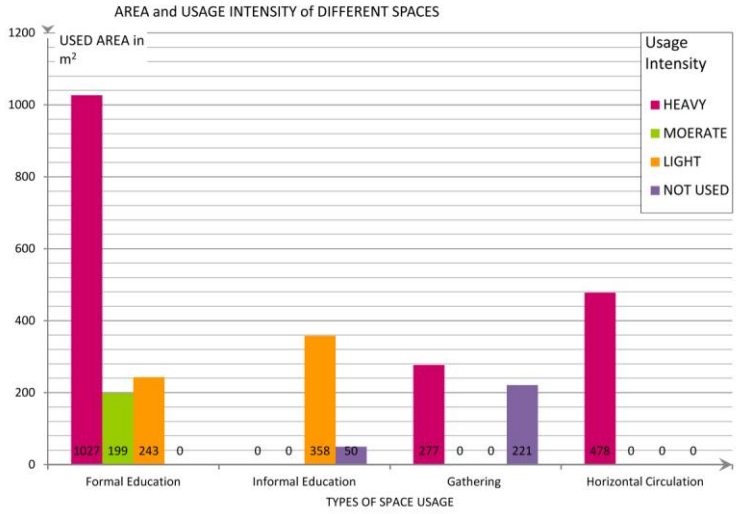

Fig. 4 Area Usage Intensities for different Spaces
Reference: Produced by Author

spaces is of much larger value than that of informal education spaces. Moreover, spaces available for gathering like cafeteria and terraces remain unused due to either maintenance or administrative reasons! The only gathering space heavily used is the hall in front of the main auditorium.

Furthermore, the analysis has revealed that a large portion of the department's net area measuring approximately 5600 m^2 is not being made any use of ! Parts of the not used areas are indoors (almost 14%) while the larger amount (the remaining 86%) is represented in unused terraces and roof areas. This is indicated in Fig. 1, 2, and 3 as well as in Fig. 5.

The department also possesses 755 m^2 of heavily used horizontal circulation space made out of corridors and hallways as show Fig. 1, 2 and 3. Despite the fact that the primary use of this area is horizontal circulation between the various department spaces, (Pera Vieira & Krüger, 2015) accentuate the importance of these spaces as an invaluable asset for informal knowledge sharing, social interaction and temporary educational events.

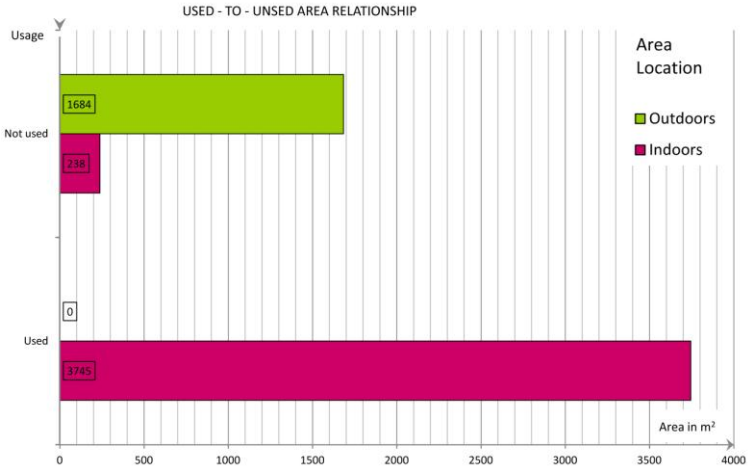

Fig. 5 Used-to-Unused Area Relationship
Reference: Produced by Author

Repeated observational walkthroughs have served registering the technical equipment condition of the department's formal education spaces in specific. The department has a total of 12 formal education spaces comprising 5 studios, 3 lecture halls, one auditorium, two labs and one classroom with a total net area of approximately 1470 m^2. Table (1) shows the available technological equipment in each of the formal education space types.

Table 1. Technical Inventory of Formal Education Spaces
Reference: Produced by author

Space Type / Equipment	Auditorium	Studio	Lecture Hall	Laboratory	Classroom
Spaces #	1	5	3	2	1
White Boards #	1	3	2	1	1
Black Boards #	0	3	0	0	0
Pin Boards #	0	34	0	0	0
Projectors #	1	1	2	1	1
LED screens #	0	0	1	0	0
Wi-Fi	not available	not available	not available	not available available	not available
Furniture	fixed	movable	fixed movable	fixed	movable
Seating Furniture	leather chairs	wood stools	leather chairs wood chairs	leather chairs	wood chairs

Indeed, table (1) makes it clear that there is a harsh shortage of basic digital media equipment like projectors and LED screens in addition to lacking Wi-Fi availability in all educational spaces except for one single laboratory. Interactive white boards are not yet to be mentioned! Also, pin boards which are an essential element for every student-architect are far not enough in 3rd and 4th year studios (where pin boards are available) and completely missing in 1st and 2nd year studios. This way, presenting design projects' progression is merely impossible for those students.

As to prevailing wall colors, white and light blue are dominant with the exception of two studios with beige and yellow orange walls. While the choice of a beige and orange combination is proved to promote a "cheerful, lively and sociable mood" (Molnar Ph.D., 2007), light blue as well as white are less suitable! According to (Molnar Ph.D., 2007), "white walls do not help reduce tension and anxiety" and blue tone are best suited for individual learning environments where more concentration and less interaction is sought, which is not

the case in architectural studios where mutual knowledge exchange plays a vital role in the succeeding of the educational process ! Fig. 6 shows a random snapshot of one of the department's studios.

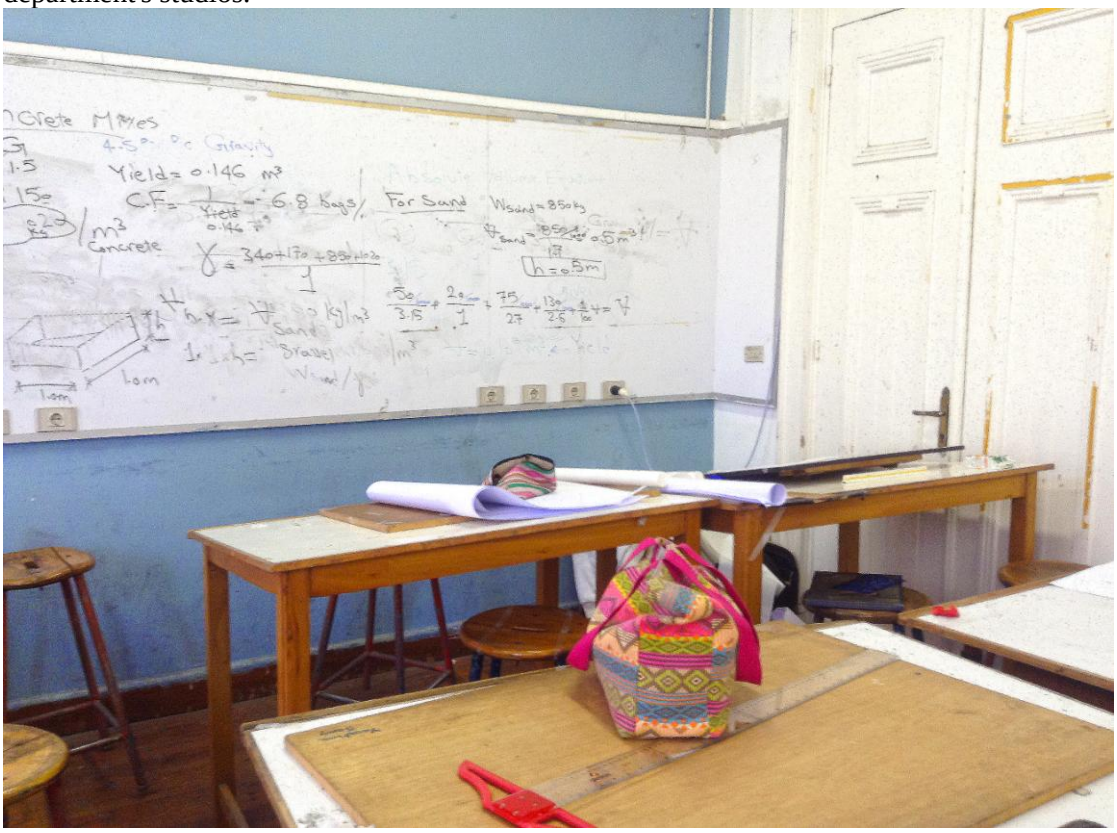

Fig. 6 Third Year Studio
Reference: Produced by author

5. QUESTIONNAIRE

As this paper intends to examine the strength of relationship between the physical and pedagogical attributes of educational environments on the one hand and the level of practical experience acquired by students upon graduation on the other hand, it was inevitable to question fresh department graduates about their personal experience of real-world architectural practice after graduation. As according to (Groat & Wang, 2013) "questionnaires are the most frequently employed technique" for examining subjects' correlations. Therefore, a web-based survey questionnaire has been designed and shared to the facebook group of 2015-graduate architectural department students of Alexandria University's Faculty of Engineering. A random sample making approximately 55.2 % of the graduates responded to the questionnaire. This percentage is believed to be satisfactory for saturation, as according to (Mason, 2010) "sample size in the majority of qualitative studies should generally follow the concept of saturation when the collection of new data does not shed any further light on the issue under investigation".

5.1 Questionnaire Design

The survey questionnaire conducted in this research paper can be considered as an *extensive questionnaire* which asks respondents to assess the *extent* to which specific physical and educational characteristics of their architecture department (identified as *independent* variables) affect 4 key Elements (identified as *dependent* variables) necessary for architectural practice after graduation; namely:

1.Teamwork and Team Leading

2.Design Negotiation and Discussion Skills
3.Architectural Software Skills
4.Self-Learning capability

The questionnaire is composed of 16 closed-format questions varying in formats between different levels of measurement scales like categorical measurements, ordinal scales, Likert scales and ratio scales as well as ranking. Yet, where scales were required ratio scales were employed in almost 60% of the questions, as (Groat & Wang, 2013) state that ratio scales have a higher degree of measurement precision than ordinal scales. Closed-format questions have been chosen for the questionnaire design as they are quicker to fill in and above all easier to code, record and analyze quantitatively (Leung, 2001).

5.2 Questionnaire Outcomes

After registering questionnaire responses in a Microsoft Access database, queries have been run to reveal relationships between physical and pedagogical environment of the department and the 4 key elements previously mentioned which are necessary for actual architecture practice. Results have shown that almost 38% of respondents prefer to work individually which is an astonishingly high percentage for a teamwork-based discipline like architecture! Causes therefore are ascribed to two main points: First of which is the inappropriate physical interior of the department and the low frequency of extra-curricular internships. Namely, internships offer an excellent opportunity for a real-world teamwork experience. The second point is related to architecture curriculum design which obviously does not provide enough convenience for group-based projects. As Fig. 7 shows, the lower the internship frequency, the more likely it is that students prefer working individually and at home. Nevertheless, even students with highest internship frequency and a preference to work in a group prefer working *outside* the department's studios. This validates the assumption that studios interiors are poorly suited and thus less encouraging for group work. And among the studios' deficiencies, uncomfortable furniture has been found to be the most influential factor leading to students preferring to work outside the department's studios. Indeed, 30% of the respondents found the furniture uncomfortableness unbearable and preferred to work in a group outside of the studio. This is indicated in Fig. 8.

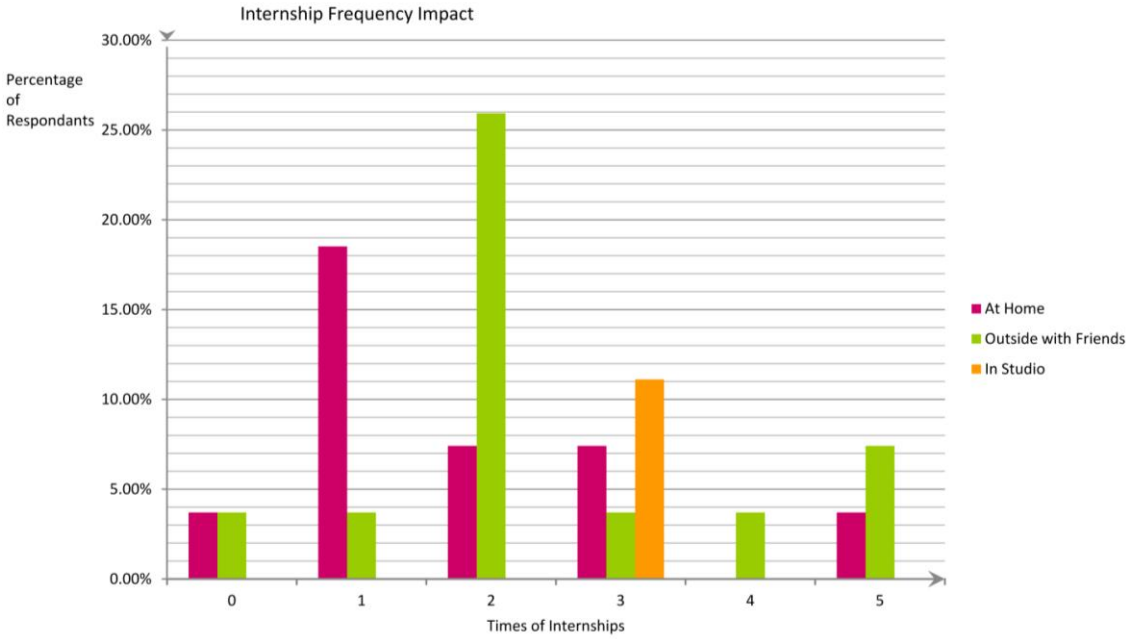

Fig. 7 Internship Impact on Place Preference
Reference: Produced by author

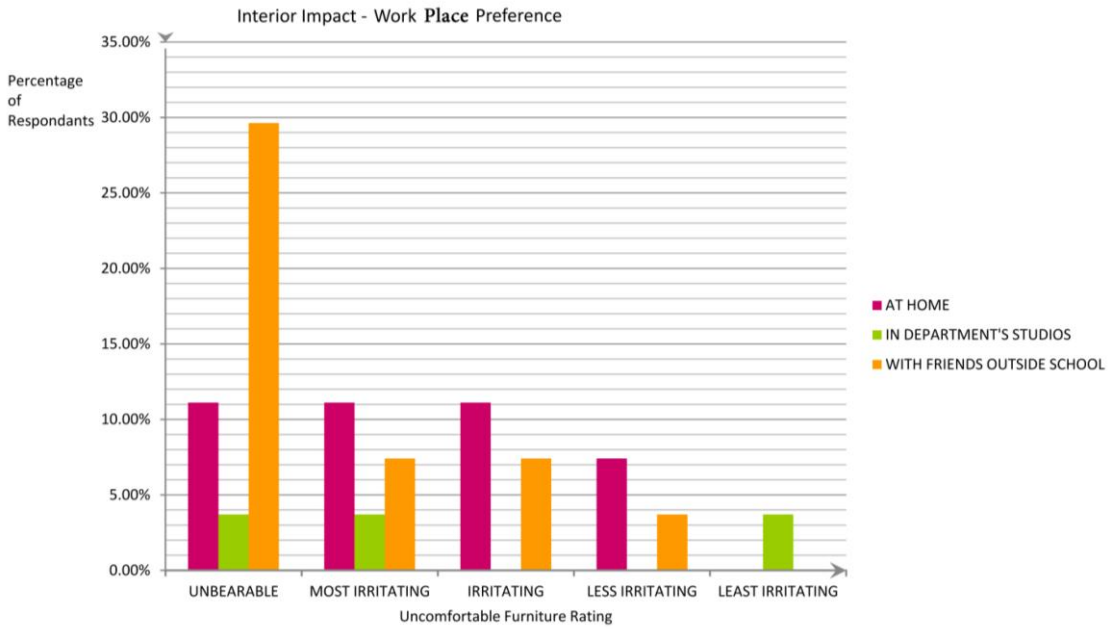

Fig. 8 Furniture Impact on Place Preference
Reference: Produced by author

As a whole, respondents found that reasons for disliking to work in department's studios are ranked as follows: The most important reason is lack of internet accessibility. On second place comes uncomfortable furniture, then follows insufficient electricity supply. Noise and poor lighting quality come on fourth place and indoor air quality seems to be quite bearable for the majority of respondents. It is therefore not surprising that a whole 50% of respondents have never participated in an architectural competition while 43% of respondents dared only once to try. For, participating in competitions requires excellent team working abilities and eventually very good team leading skills. And the confusing thing is, that 37.5% of respondents consider their team leading abilities as "very good" while approximately 44% believe to possess good team leading skills! This indicates that students do have the will and believe to have the potential to team-working, but apparently do not get the opportunity to deploy it!

As to design negotiation with clients and self-presentation skills in job interviews, questionnaire results have revealed a strong deficiency that seems to be rooted already in the early design studio experiences. Namely, (Utaberta & Ismail, 2014) accentuates that "education has direct effect on thoughts and ideas and can even make line behaviors for humans. Almost 56% of respondents have difficulties in job interviews and design negotiation with clients or their direct job superior, and approximately 38% already had this problem with academic staff members in design studio discussions. Consequently, 50% of respondents with self-presentation and discussion difficulties never tried participating in architectural competitions while the other half dared it only once! Another important point to mention is that 44% of all respondents consider themselves during academic lectures as either only attending or even mentally absent. Apparently, the lack of multimedia use in lectures - 63% of respondents agreed that multimedia are seldom used in lectures - make provided academic content less interest-evoking and less inviting for interaction.

Speaking of architectural software know-how, 88% of respondents agreed that the department's curricula did not provide them with the necessary proficiency. Similarly, almost 69% of respondents assessed their familiarity with architectural building materials, their properties and suitability for different uses as far below average (10% - 40%). And relating to Fig. 4, this is logical consequence of not making use of the available materials and computer labs.

Nevertheless, 64% of respondents with weak materials and software knowledge assessed their self-learning capability as "excellent" to "very good", among which 54% have a two times internship experience, and 27% have an internship experience of 3 times or more. This shows clearly a strong relation between internship frequency and development of self-learning skills. Unfortunately, more than 30% of respondents did either never have the chance to do an internship in architecture or rather had it once.

One further very important point to mention is the actual relevance of provided academic curricula to real-world architectural practice. Surprisingly, 31% of respondents found academic curricula by only 30-40% relevant to practice, while 44% of respondents assessed curricula's relevance to job practice between 50-60%.

6. CONCLUSION

As a final conclusion, this paper has shown that the department subjected to study and examination has some weaknesses in terms of lecture and studio pedagogy as well as interior physical environment. Nevertheless, the department and the enrolled students possess a very good potential for upgrading to the better and overcoming presently existent obstacles. In the following are 13 recommendations for this purpose:

Firstly, changes in terms of the physical space need to be undertaken; these include tackling following points:

1. Permanent and reliable access to the internet has to be guaranteed for at least all studios and the library (classrooms and auditoriums could be excluded).
2. Studio furniture needs to be more flexible in terms of seating layout as well as in terms of the ability to be used for both manual as well as computer-aided work. The choice of table shape (e.g. trapezium-shaped tables) together with mounting them on wheels helps increase seating order variability while decreasing the time needed for rearrangement. Also, every student should be provided with enough "pin-area" next to his seat to present his/her project's progress to other colleagues, as this stimulates discussion and "informal spread of knowledge" while also boosting students' confidence.
3. Seating furniture needs to be more comfortable; the use of rolling chairs instead of wood stools could provide a solution.
4. Warm colors should be used for wall paints instead of light blue and white. Yellow-orange, beige and yellow-green could be a more suitable alternative.
5. All classrooms, studios and the auditorium have to be supplied with interactive as well as traditional white boards. Black boards are no longer appropriate for use, especially as over time the "chalk dust settles over circuits causing overheating and ruins vulnerable equipment" (Molnar Ph.D., 2007).
6. Unused amenities like cafeteria and terraces, even the large roof area should be made use of for providing recreational space for students, especially as the department is located in the third, fourth and fifth floors of the building and lift access is not granted for students. Thus, provision of a comfortable place where students can take a break is necessary for time saving above all as students often have long-day sessions involved with the final drafting of projects. For, (Taylor, 2010) highlights that "students have developmental rights across body, mind and spirit that must be translated into corresponding levels of architectural habitability" of school buildings.

Next, changes related to pedagogical environment are recommended:

7. Not frequently used labs like the material lab, the cave, the laser-cutting and 3D printing lab and the computer lab should be more integrated in weekly assignments in order to encourage students to explore the capabilities of the technologies provided by these labs.
8. More group-based, also collaborative projects should be given to students. Coordination with other faculty of engineering departments could provide a good basis for this purpose.

In fact, cross-professional collaboration has become an internationally growing demand in architectural practice (Orr & Gao, 2015).

9. Students should be given the chance to present their projects during different progress phases to their colleagues in order to "break the ice" of group shyness and develop confident discussion skills.
10. Lecturing should be rethought to have a more of a discussion-like character where everyone participates, brainstorming techniques are applied and multimedia are integrated for better visual presentation and stronger interaction. Interactive white boards play a very important role in this respect.
11. Official educational trips should be organized by the department to factories producing building materials, exhibitions for building and construction, historical buildings even wood, iron and glass workshops, in order to give students the opportunity to explore the real-world professional environment while still being able to pose questions at an academic and get processes explained. As (Abdulkarim, 2014) accentuates the "absence of practical on-the-job experience through monitoring by a master" as one of the major contemporary problems of academic architectural education nowadays.
12. Web-based interaction between students and academic staff members through "facebook" groups or "Piazza" would enhance monitoring all student's daily progress in design projects without being restricted to scheduled studio hours and without being bound to a certain place. This is also beneficial in group projects as (Utaberta & Ismail, 2014) point out that "coordination activities often affect students working and learning time", and through web-based communication a lot of time wasting can be avoided, above all because this sort of communication is asynchronous.
13. Provided curricula need to be more practice-related. This can be achieved through laying more weight on "adaptable design projects" described in (Bolak Hisarligil, Lokce, & Oktay, 2013) which are able to serve unforeseen functions in an uncertain environment instead of "point design projects" where function and environment are concretely described and unchangeable. For, still according to (Bolak Hisarligil, Lokce, & Oktay, 2013), "the graduate's ability to serve unforeseen roles in a continuously changing world depends on versatility, flexibility and interoperability".

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