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Exploration of Influential Factors on First Year Architecture Students' Productivity

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Abstract**—**The design process in architecture education is based upon the Learning-by-Doing method, which leads students to understand how to design by practicing rather than studying. First-year design studios, as starting educational stage, provide integrated knowledge and skills of design for newly jointed architecture students. Within the basic design studio environment, students are guided to transfer their abstract thoughts into visual concrete decisions under the supervision of design educators for the first time. Therefore, introductory design studios have predominant impacts on students' operational thinking and designing. Architectural design thinking is quite different from students' educational backgrounds and learning habits. This educational challenge at basic design studios creates a severe need to study the reality of design education at foundation year and define appropriate educational methods with convenient project types with the intention of enhancing architecture education quality. Material for this study has been gathered through long-term direct observation at a first year second semester design studio at the faculty of architecture at EMU (known as FARC 102), fall and spring academic semester 2014-15. Distribution of a questionnaire among case study students and interviews with third and fourth design studio students who passed through the same methods of education in the past 2 years and conducting interviews with instructors are other methodologies used in this research. The results of this study reveal a risk of a mismatch between the implemented teaching method, project type and scale in this particular level and students' learning styles. Although the existence of such risk due to varieties in students' profiles could be expected to some extent, recommendations can support educators to reach maximum compatibility.

Keywords**—**Architecture education, basic design studio, educational method, forms creation skill.

I. Introduction

THE concept of studio-based learning refers to the students' active participation in solving specific given problems and finding the most appropriate solutions. Design studio, as the core of architecture education, aims to equip students with certain skills that are the pre-determined objectives of each design studio in the academic year. Thus, the studio assignments should be structured in a coherent manner so that students can follow learned subjects and experiences of each step in further levels. In the meantime, first year students are especial cases due to their very limited skills and knowledge. They start to deal with the challenge of transforming basic geometric shapes into architectural form through their unique ideas. Therefore, applied methods and means through the educational process for this level play a fundamental role in the students' educational progress.

Many factors contribute to the quality of education and achievement of pre-determined studio objectives. Admission policies, students' profiles, pedagogy, the competency of selected instructors and their experiences, assignment types and physical spaces have salient impacts [1].

Universities' entrance systems with heavy reliance on science and mathematics, vocational education graduates entry and transfer regulations create a wide range of students' profiles. This diverse profile would also be accompanied by different students' learning habits as well. It is well known that architecture students have difficulties in adapting to their professional education at the beginning. Architecture education in contrast with pre-university education seeks active participation rather than passive learning, supports exploration rather than providing ready information, stimulates risk taking attributes rather than offering safe ground, focuses on learning from failure while considering multiple authorities.

The purpose of first year architecture education is to free students' minds from established, regular and inflexible patterns and guide them to perform in the architectural design manner. Students from different backgrounds train to enhance their synthesis and analytical abilities, communication, visualization and representational skills [2].

Basic design studio is usually based on the design concept generation and creates a learning medium by experimenting with the procedures of two or three dimensional forms. Students will become familiar with the basic design elements as well as design principles throughout the semester. They also have been introduced to the "vocabulary of design" through their form-creation process [1]. In fact, one of the major purposes of the design studio is equipping students with the ability to transform their imagination into innovative design solutions [3]. The nature of this teaching method, which unconsciously creates mental images for student, creates a sense of confusion, which makes the learning process more difficult. There are three defined design teaching methodologies that could be adopted into first year education as well. These are, teaching through knowledge transformation, by inductive discovery and through the individual learning method [4].

All the aforementioned methods are applied in the introductory design studio but still the main method is

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"Learning-by-Doing", the dominant form of design education at the beginning stages and supported by some related lectures and implemented in the studio environment.

In first year architecture studios, students and instructors work jointly to develop the initial design ideas and appropriate design solutions by means of revising and monitoring and also highlighting the problematic parts of the student's design project by the instructors. Outcomes demonstrate student's performance at combining their design strategies with established architectural terminologies [5], [6]. But this process could be easily turned into geometrical puzzles and difficulties for students and lead them to forget a main domain of their design ideas. Realizing students' needs through their design processes and improving architectural teaching methods could diminish the students' challenges in their design process.

This study aims to compile all influential factors on first year architecture students' productivity and evaluate their efficiency through direct observation and qualitative and quantitative analysis of findings from a selected case study. Eastern Mediterranean University (EMU), Department of architecture aims to offer high educational quality in the procedure of many accreditations, therefore the results obtained and the recommendations subsequently presented for this case could be valid and supportive for other architecture schools as well.

II. Educational Methods and Means in Architecture Design Studio

Green & Bonollo believe that in Project-Based Learning, students are supposed to find and define the design problem [6]. Therefore, exercises that are sufficiently complex and have multiple possibilities to be done prepare a situation for the students to learn formal design methods and tools and lead the students to create a successful design. Thus defined student exercises and project types are very important. To compose architectural form, geometry's role is undeniable.

Introducing the geometric shapes and characteristic of point, line, surface and figure is necessary and expected in the first year of architecture education. Students need to be trained to characterize all positive and negative aspects of basic geometric shapes and different geometric transformation approaches in order to achieve a final design product by the means of design problem solving [8]. Geometry could also be a source of creativity and inspiration in the architectural design process [2] especially, for students at the introductory design studios. On the other hand, selection of the appropriate assignments has profound effects on implementing the studio pedagogy. Introductory design as a grammar of visual language in design education has its own specific design principles that are related to architecture and building construction and aim to lead the students to understand design principles and visual language through the design project and practicing. Thus, basic design students could develop their visual thinking and special perception of space by carrying out the design assignments [2]. In addition, tutors in basic design studios improve students' impressions of real architectural projects. They also attempt to inform students how design principles participate in the architectural design process. Project requirements in basic design studio help students to have a deeper design perception and present rational design solutions [6].

Applied educational methods in basic design studios make students familiar with design principles and design limitations to elevate their mental images. Design practices increase students' confidence to think individually and also help them to materialize their design thoughts [7]. There are varied types of design projects through the basic design process. Firstly, "Draft Projects" are developed according to the concept and project requirements. The result of this stage are then presented as "Formal Works" that enhance the formal transformation of a draft product from the previous stage by geometrical transformation in order to transmit the realized formal work into a "Final Project", which is presentation of materializing the design ideas as a design product [8]. Defining the design problem for introductory design studios should be done in such a way that students perceive the quality of a space and propose rational space arrangement [9]. It should also help students to organize their mental images for presenting smart design solutions. Some common activities such as Brainstorming, Abstraction, and Geometric Transformation, Verbal and Non-verbal Communications within basic design studios improve students' creativity with respect to their talent [2]. Integrating design exercises with history, sustainable elements, nature, geometric shapes and architectural biographies as the source of creativity is very practical for basic design students to have distinct architectural articulation in their projects [2].

Communication has a fundamental effect on a student's experiences in architectural design learning [10]. Schön claimed that the "Critique Process" will be formed through this mutual communication in the design studio. The design instructor will understand the students' learning process while communicating with them. Design studio is regarded as the "Communication Medium" for two sorts of active actors: "Students" and "Educators" [11]. This medium is a well-supplied milieu for communication and team working because it encourages students to work in a group with various verbal and visual communication skills [12]. But students' communication skills are the main obstacle in achieving the abovementioned objectives. Basic design students have difficulties in communicating and sharing their design ideas with the others. However, the introductory design studios were formed in such a way as to train students to overcome this obstacle through learning the appropriate skills to present design ideas both visually and verbally (9).

Design is a common language among architects which requires verbal and non-verbal communication between students and instructors. Design instructors at introductory design studios create and develop students' design language and also prepare them for the future. Thus, design educators are training students to have their own design language for their final products. Furthermore, each design instructor has his or her own method while communicating with students.

For example, some of them give critiques while others prefer demonstrating through sketches or model making and some use both methods [10]. Teaching beginner students is a great responsibility. Prepare individuals, and advising, inspiring, monitoring and counseling through the training process is needed [3]. Based on the aforementioned literature it could be concluded that students' exercises and project types, the form generation process implemented by instructors, instructors' experiences, the communication tools used – including verbal and graphical –are the most influential factors. But the quality of the space and the studio's physical condition are inseparable facts as well.

III. Method and Material

Qualitative and quantitative research methods have been applied throughout the study. Research data has been collected through direct observation at EMU Department of Architecture.

Throughout the observation, a questionnaire survey was distributed among FARC 102 Introduction to Design students and interviews with 4 professors were conducted.

Junior architecture students in North Cyprus will experience architectural designing at the basic design studios for the first time. They could obtain specific abilities to transform their imaginations into concrete outcomes in their foundation year. The essence of the teaching method at this level is rooted in the Bauhaus, especially one basic course which was disseminated by Itten at the beginning of 1920. First-year design education at EMU (known as FARC 101 and FARC 102) is considered a foundation year and involves the architecture and interior architecture students. The chosen case study for the research is the introductory design studio at EMU Department of Architecture (FARC 102), held twice a week. To maintain the idea of foundation education, students had the chance to take FARC 102 studio with the same instructor with whom they were registered in the FARC 101 studio.

On successful completion of the course, FARC 102 students are expected to have improvement in their design knowledge and skills in problem-solving, verbal and visual communication, form-making, graphic communication, team-working, time management, and decision-making and planning drawings. Starting the semester, students were given a warm-up project to be worked on for a week and after the project would be introduced to students. Throughout the whole semester, FARC 102 students had a site-visit session, two times in-term jury (pre-midterm and pre-final jury), one mid-term jury and one final jury for evaluation of their design development and progress. The percentages determined for each stage as indicated in Table I take into account process and progress and promising to the requirements for each stage as well.

Designing a personal living, working and performing space for musician "Music Park" and writing a scenario about the desired design strategies for the semester project should be accomplished by the FARC 102 basic design students. Students were expected to have their first proposal in terms of design models and sketches and also one case study poster containing some keywords which showed the students' perception of the "musician" and gave them some clues in the process of form generation for their semester design projects.

TABLE I
Semester Submissions and Requirements for First Year (Sample of Second Semester FARC102)

Warm-up project	Site analysis + Scenario development + Concept development	Pre-midterm	Midterm jury	In-term jury	Pre Final jury	Final jury
10%	10%	10%	20%	10%	10%	20%
	Mid-Term jury required submissions				Final jury required submissions	
• Site Plan Scale: 1/100 • Plans Scale: 1/100 • Silhouette Scale: 1/100 • Site Sections Scale: 1/100 • Elevations Scale: 1/100 • Model Scale: 1/100 • Site Analysis poster: 1/500 • Concept, Scenario, Structure Poster, 70*100 Cm				▪ Site Plan Scale: 1/100 ▪ Silhouette Scale: 1/100 ▪ Site Section Scale: 1/100 ▪ Plans Scale: 1/100 ▪ Sections Scale: 1/100 ▪ Elevations Scale: 1/100 ▪ Design Model SC: 1/50		

Fig. 1 Students' Key-poster samples of FARC 102 Design Studio in Fall Semester 2014-2015

During the conceptual design period, at the beginning of the semester, the course coordinator presented some pictures and sketches on a screen during the studio hours as examples in architecture, interior design and art. She explained the pictures in a simple way and clarified the initial ideas behind each design in order to give students some clues about the formal architectural design. The instructor reminded students that design is an experiential issue, so they should try to play with forms in order to achieve rational organization for their designs. She guided students to define their concept by "inspiration" not "imitation" which is also one of the appropriate instructional methods in architectural design. The instructor emphasized that students should express their design ideas in a way that could be comprehended easily and along with architectural design principles. During the critique sessions, the instructor first listened to the students' explanations of their design ideas on their proposed models and then the FARC 102 design mentor tried to reshape the

proposed mass into a more appropriate form with respect to the students' ideas and the formal architectural design instructions. The instructor also made some sketches of her design ideas while criticizing the projects to clarify her suggestions for the students (the instructor's sketches were given to the students after the critique). Students at the end of the critique time should take photos of the latest version of their design models obtained via the instructor's critiques to improve their design in the suggested way and then show the photos in their next critique session

IV. Findings

The material of this section would be presented in three categories, Firstly, students' responses to the questionnaire, direct observation and finally tutors' interviews.

Fig. 2 demonstrates the students' expectations priorities from their instructors. The highest number belongs to "motivating student's creativity" (55%), "teaching related design strategies with the project" (55%) and "letting students figure out the proper design solution" (50%) which show students' willingness to be independent in their design process, as the figure shows 55% of the students were expecting relevant design strategies to be taught to them and to be motivated by their instructors. Moreover, they were looking for support in finding design solutions rather than providing them ready solutions (25%). Interestingly, 35% the students preferred their design concept to be provided by the tutors.

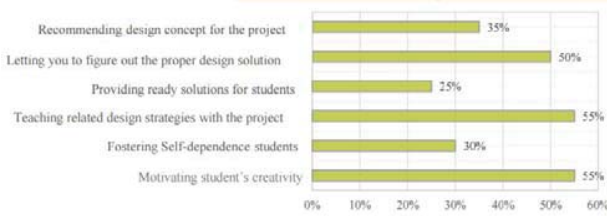


Fig. 2 Students answer to the question: "What do you expect from the design instructors through your learning process at studio?"

Students were asked to evaluate the use of named methods and tools by giving them a value as Fig. 3 reveals that precedent studies, studying most related projects and theories that can support them in their design process are the most important ones to them.

How do you value the following statements?					MEAN
Very Good (5)	Good (4)	Average (3)	Bad (2)	Very Bad (1)	
Impact of theoretical courses of design principles and elements on your form finding process.					3.83
Importance of lecture notes on your design learning process.					3.58
Influence of similar examples in relation to your design project to improve your design.					3.88
Impacts of those examples to transform your design concept into the design product					3.75

Fig. 3 Mean format of Student's given value to the statement

As Fig. 4 indicates, students received a personal critique on their initial models (working model) and received comments and guidance for further improvements. The revisions on proportions, orientations, usage of site, form transformations were general given critiques to the students.

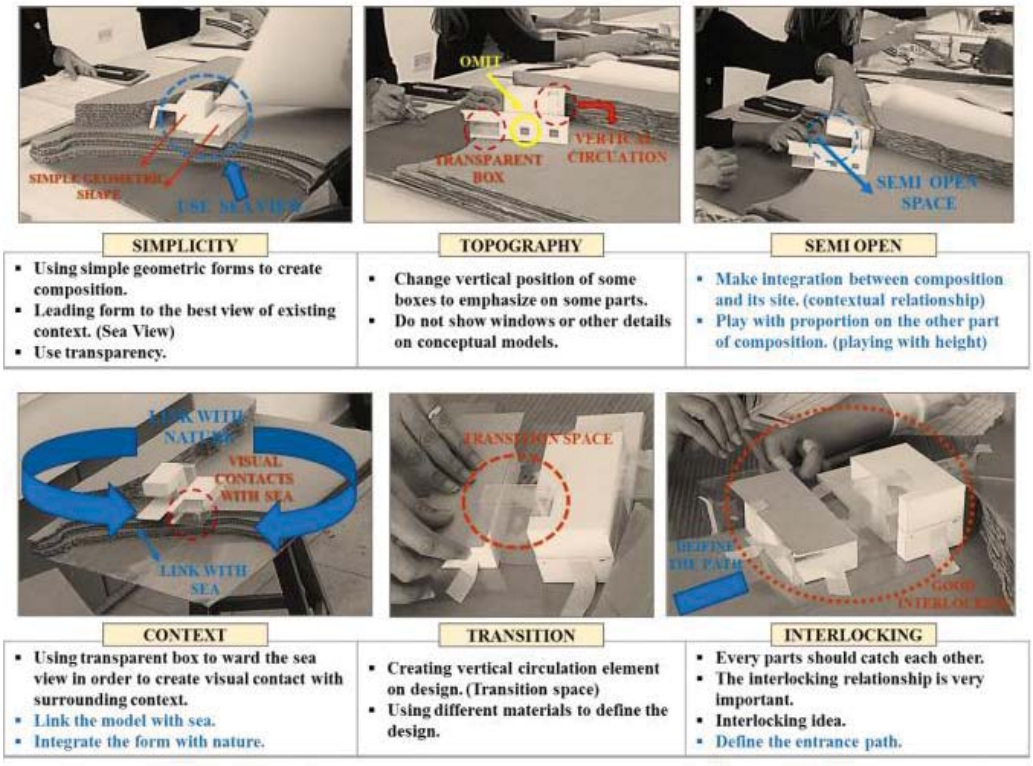
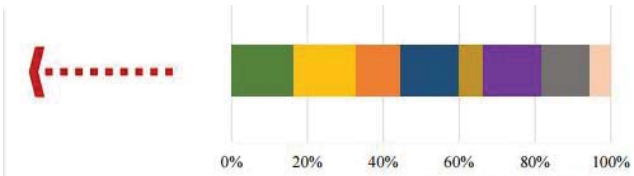


Fig. 4 Sample of design project review in one critique session

Five weeks into the semester and close to the midterm stage, the students were asked to point out the factors they found more influential and or important through their sessions. As Fig. 5 shows, creativity, graphic communication and self-criticism together with receiving motivation from their instructors were rated the most.



What kind of factors do you think are important in architectural design?	
Creativity	75%
Motivation	75%
Design knowledge	55%
Self-criticism	70%
Artistic talent	30%
Graphic communication skill	70%
Hard-working	60%
Imitation	25%

Fig. 5 Students' answer to the question: "Which factors are more important to you in design?"

Instructors' interview reveals that they have concerns in terms of students' different profiles and the possibility of creating a homogenous teaching method for everybody. They believed fresh students have a kind of misunderstanding about creativity, unique ideas and innovations. A communication problem, since they believe lack of concentration is one the most common difficulties students have at this stage.

The other problems named were unsuitable projects and assignments not only in terms of themes but also in scale and scope. They believed that the scope of the project should be reconciled with a student's ability and level of understanding and instructors or coordinators should be extremely realistic and rational. Providing a systematic program for the semester and determining certain deadlines can support the existing problem of imbalance among students in design development. Keep showing relevant examples was mentioned by instructors as a method they used to facilitate communication with students. They believed students' lack of knowledge and skill could be supported by the use of graphical or visual tools. All instructors agreed that the existence of such problems should not become an obstacle to achieving course objectives or decrease the students' product quality. They continued that the selection of instructors for the first year course is very crucial and relying solely on the possibility of competent selected instructors joining these studios might not be enough. The involvement of experienced instructors and instructors with less experience in the first year could be a better strategy.

V. Recommendations

The findings have shown that students' performance through the design process tends to be individualistic and owe more to intuition than formalistic procedure. Students are also faced with some challenges and dilemmas through externalizing their design ideas and thoughts as the concrete products of their form-creation procedure. Furthermore, exerting relevant design strategies through the students' learning process has enriched their design knowledge, skills and experiences better than just making forms through the design process. Based on the literature, direct observation and conducted surveys of this research, the following recommendations could be supportive to current concerns in first year architecture education.

- Increasing the number of group critiques during the concept generation stage of the design process. Compelling students to listen and participate in the studio discussions and express their ideas on their peers' projects and listen to their peers' individual critiques.
- Designating a portion of the total grade to be given over to the students' contributions to the discussions and critiques.
- Creating more opportunities for the students to express their design ideas and thoughts verbally as well as via their sketches and design models, by operating more group and rotational discussions during the studio hours and getting students involved in the conversations. And expecting students to criticize both their own and peers' projects throughout the semester may enrich their confidence, responsibilities and cooperativeness in their design process and project development process.
- Involving more experienced teaching instructors in these critical studios. Further, providing horizontal coordination and more meetings among design instructors' groups for defining some normative standards to follow and students' expectations could be a kind of modification for this problem
- Allowing more time for theory-oriented study within the design process. Expecting students to define the architectural design principles and proper design strategies at varied stages of their design process. In order to highlight the role of theoretical knowledge and design strategies through the form producing process.
- Running training workshops with the purpose of improving students' form-creation skill, which could help students to materialize their subjective ideas into the concrete visual decision via the notion of geometrical transformation, orders and design principles in architectural designs.
- Compelling students to explain more about the design principles employed in their project while defending their design projects. For example, at the beginning of the semester, in addition to the site analysis, asking students to do some research on the architectural design principles to have a better perception of the general design principles and formal architectural designs. Students also have to choose and highlight their desired design principles which they are going to use in their term design projects. After that, based on the findings they could write a scenario and review their set methodologies which are going to follow through their design process.
- Instructors presenting similar examples with comprehensible design principles for the students in a format of slideshows (soft copy) during the studio hours

at the beginning sessions in the concept generation stage or in a file format (hard copy; printout) during the semester.

- Structuring the thematic framework base of the course objectives as the design recipe for students to follow throughout the semester. The proposed framework could be structured with the relevant design theories according to the term project and some suggestions in material selection for model-making, presentation technique and the appropriate workmanship to improve the general design quality could be given.
- Having more expectations from students through their project development process and increase their attentions by stopping giving critiques on the projects while no satisfactory improvement is observed, and also by not accepting minor changes on the projects in their development process.

VI. Conclusion

The interpretation of these research results concludes that, despite authentic applied teaching methods in the introductory design studios at EMU, for reasons such as students' different educational backgrounds and methods in their secondary schools and extending their learning habits through the design education which is acceptable to a certain extent, still students' final products do not show expected excellences achieved. This weakness could be the result of a risk of a mismatch found between the implemented teaching method and its desired learning outcome, which consequently misleads students in approaching productive forms and expressive architectural designs. Thus the result of this study could be supportive not only for this selected case but also for this majority of other architectural programs which share the same concern.

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