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EXPERIENCING THE REAL-SCALE: MOCK-UP OF A SET DESIGN PROJECT

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1. The design studio project on which the study is based was part of the Interior Design Studio III at the Department of Interior Architecture and Environmental Design, Bilkent University. The authors would like to thank Nilgün Çarkacı, Şule Aybar and Levent Tümer, with whom we developed and taught the studio, and all the students who participated in the project. We would also like to thank our department and the Faculty of Arts, Design and Architecture for providing encouragement and financial support.

This paper (**1**) claims that in spite of the unique opportunities introduced to design learning by the emergence of virtual models, the benefits of learning through building in real-scale cannot be totally disregarded. Within this framework, a real-scale project through which students could study light, color and texture was proposed in a senior interior design studio course. Students were asked to work in groups and create a set design, using different objects, materials, colors and lighting configurations within a mock-up space. This paper presents an assessment of the students' responses to the project, discussing the impacts of the project in terms of three main aspects: learning by doing and seeing, learning in different styles, and learning in a group environment. The study suggests that despite its functional difficulties both in terms of provision of space and budget, the integration of even simple real-scale projects to the design studio may be a viable option in design education, enhancing students' comprehension of the transformation between the design and its application.

INTRODUCTION

Architecture students represent their design ideas in scale. Yet, to the novice eye, transformation from full scale to any other scale (or vice-versa) can be difficult. Thus, students are often compelled in imagining the impact of architectural elements in real life through scaled presentations. As design education aims at closing the gap between design ideas in scale and in reality, giving students the opportunity to apply design ideas in full scale - that is the *real-scale* - may be very beneficial. In line with this argument, previous studies indicate full-scale implementations to be the 'most effective mean to experiment with space,' (Abbo, 1996, 1999) and conceptions of spatial dimensions/proportions to be concise in one to one scale (Liner, Martens and Voight, 1996). Also, previous research suggests that design schools would benefit from integrating

full-scale implementation to their curricula (Carpenter, 1997; Ofer, 1999; Schreibmayer, 1996).

Considering how architectonic qualities and layout of a space are developed in the design studio, working on and presenting the design with drawings and scaled models may be an appropriate and satisfying method. For example, images of physical settings were found to produce very similar evaluations to those of actual spaces (Danford and Willems, 1975; Daniel and Meitner, 2000; Hendrick et al., 1977). However, when the design problem comprises lighting and its impact on surfaces, textures, and colors, models may be insufficient. A scale model may not represent the effects of light in full detail because of difficulties in attaining required (scaled down) light sources, textures and color that would be identical to those in real life.

No doubt, at this point it may be asked whether handling a project in the virtual environment would compensate for the lack of real-scale. In that case, it should be noted that even the experience gained through virtual environments still needs to be analyzed and transferred to the domain of the real environment, which would load yet another task upon the students. Furthermore, no simulation of light is capable of giving the full effect of reality, as it would in a mock-up. In addition to this, a system, which would generate a virtual environment with similar equipment as in the mock-up, would be difficult to establish and too expensive to afford for many schools. Finally, no virtual experience would enable students to get the sense of gripping tools and turning their conceptualization into a physical reality that they could walk around and touch.

> Within this framework, the question posed was whether and how the integration of a simple mock-up space would affect the learning of senior design students. The choice of senior design students was a conscious one in order to guarantee that they have experienced various design learning methods, but a real-scale one, so that they would be able to make comparisons. Consequently, the third year interior design studio within a four-year interior architecture curriculum was re-organized, integrating a real-scale project. As such, during the semester, students were given projects in three successive phases: First, they were expected to design supporting backstage spaces related to a performance area. Second, they dealt with the mock-up space, designing an installation, accentuating light and lighting effects. Finally, they designed the set of an international song competition, applying the knowledge and experience gained through the real-scale exercise in a larger field, in terms of both area and requirements.

INFORMATION ABOUT THE DESIGN STUDIO

One of the aims of the design studio in the mentioned curriculum is to equip students with skills of using and manipulating light for creating a desired ambience in interior spaces. Typically, simultaneous with design conceptualization, students are expected to develop ideas on the lighting and light effect in a project. As the design matures, they represent their designs with a scaled model with lights, as well as drawings, in a regular design studio. After years of experience in teaching design studio, involving such scaled representations, the authors observed that the lack of real-scale applications frequently leads to misunderstandings, misinterpretations and underestimations of light effects as well as design details.

Figure 1. The mock-up application; Left top and bottom: Construction process of the mock-up application; right: one of the two design spaces defined by the mock-up enclosure (2 x 3 x 3.5 meters).

Mock-up Application

In view of the above-mentioned concerns, an experimental phase was integrated into the interior design studio, in which students could design a set in real-scale using a mock-up space. The enclosed mock-up space was designed and installed inside the studio by the instructors (authors and three other instructors). The enclosure was established by hanging three sheets of white canvas from the (four meters high) ceiling to the floor to form an *H-shape* in plan (**Figure 1**). Thus, two back-to-back spaces of two by three meters were defined (with a height of three and a half meters). The perpendicular line of the H-shape between the parallel sides acted as a space divider. This design provided students with two identical spaces to work in, and saved time during presentations, as it allowed the next presentation to be prepared simultaneously on the other side.

A timber grid structure holding six movable light fixtures with pre-determined locations was hung from the ceiling above each sub-space. This structure could also be used to hang additional lighting fixtures, as well as lightweight objects for the set design (**Figure 1**). Six light fixtures that could be used to attach desired bulbs were numbered and connected to a control panel, which allowed for dimming and disconnecting power for safety.

Groups of three to four students were asked to prepare installations within the space defined by the mock-up. The installations were expected to represent two selected seasons of the year. The installations would be comprised of at least four three-dimensional hanging or standing objects, various numbers of different textured surfaces and lighting elements. Additionally, the installation was to be supported by a musical piece for each season. In other words, the presentations were to include the theme of two seasons represented by moving and stationary objects, supported by musical pieces and lighting, lasting approximately five minutes.

The project took four weeks to complete. Initially, the students were asked to prepare their design suggestions using a 1/10 scale, working model (**Figure 2**). After receiving critiques, they applied their ideas directly on the mock-up, using objects and surfaces of their own creation. This step

Figure 2. The initial design suggestions of a group of students on a 1/10-scale working-model with lighting. Left: Representation of summer by bright lighting; right: Representation of fall by dimmed lighting and elongated shadows and a representation of a twister.

was significant as the students realized some of the problems that they did not notice previously with the scaled model. Some new ideas were also generated during this phase, as the students learned to deal with the complexities of working with real-scale.

The real-scale offered many challenges including working with different materials, using specific design details, handling lighting effects created by different sources, achieving the desired colors and textures, as well as organizing the mobility of the objects. The students received critiques regarding not only the overall ambience of their designed set, but also of the sizes, positioning, colors and textures of the specific objects or surfaces used in the set. The critiques were held in three sessions, the last one being their final presentation (**Figure 3**).

Figure 3. Real-scale installation of a group of students within the mock-up enclosure. Top: Representation of Fall by using static composition and dimmed lighting; bottom: Representation of spring by elevating the upside-down pyramid and increasing the intensity of light.

STUDYING LIGHT, COLOR AND TEXTURE IN REAL-SCALE

The real-scale project, described in this paper was a modest effort achieved through a simple mock-up space. However, it provided means to observe and analyze students' performance in terms of three main aspects:

a. Learning by Doing and Seeing: In previous studies, learning by doing has been found beneficial in the senses of acquiring new aesthetic concerns, improving material knowledge and improving the ability to imagine the design in three-dimensions which would help students in their future design careers (Yamaçlı, Özen, and Tokman, 2005). In this case, students experienced reality in the sense that they saw the full effects of light sources and luminaires, in terms of resulting lights, reflections and shadows falling on different materials, textures and colors. They also designed and constructed their own details for the objects to be used in their set design. The real-scale project also allowed students to experience a research-based practice, which as Danvers explains is a continuous process of making, finding and trying out (Danvers, 2003). In addition, the students were given the chance to transfer their experience and test their knowledge in a broader scale with the follow-up project involving the set design of an actual international popular song contest.

b. Learning with Different Techniques: Employing a number of design methods and judging which would best serve their preferred learning styles. Being knowledgeable about the way people learn, that is, the learning process is important for improving any learning environment (Leutner and Plass, 1998). Learning is an internal process that is different for every learner, and learning tendencies are the ways learners acquire new information. The preferred method of receiving new information in any learning environment is the learning style of the individual (Demirbaş and Demirkan, 2003). Every individual has some distinctive and consistent ways of perception, organization and retention of new information (Hsu, 1999). Each learner has preferred ways of learning through experiencing, thinking, doing and/or reflecting (Durling, Cross and Johnson, 1996; Kolb, 1984; Willcoxson and Prosser, 1996). Throughout the design education process, students either consciously or unconsciously experience these different tendencies. Consequently, it is important to figure out the learning tendencies and styles of design students to organize an effective design teaching-learning situation. It may be argued that the addition of the real-scale project to the design studio would contribute to design learning by appealing to more students who have different learning tendencies. Thus, students can develop different modes of learning (Danvers, 2003), and the course syllabus can be modified to let a wider range of students enjoy and benefit from the projects.

c. Learning in a Group: The real-scale project was assigned as a group project. Groups of three to four students worked on the design of a set. Here, students were introduced with the benefits and difficulties of working in and learning from a group - again, a real life experience, as building in real-scale.

OBSERVATIONS AND EVALUATIONS

The studio instructors were pleased with the outcome of the real-scale project. Critiques and remarks of visiting instructors who attended assessment phases of the project also showed that the mock-up application was motivating and provided a useful experience for design students. They pointed out that the real-scale provided students with a chance to experience real life design details and perception of proportional relations between objects and space. In addition, students had the chance to experience light and its effects on different surfaces in real-scale. Materials with different colors, textures and light absorbency qualities provided valuable experience in terms of lighting design (**Figure 4**).

In general, the real-scale projects received highly appreciative critiques, and there was much interest in the project from junior design students. Many students from outside the studio stated their desire to participate in such an “exciting project” in the future.

> Overall reaction of the students to the real-scale project was quite positive. Since the application of such a project was new to students, they were asked what they thought about their experience of the project, using an extensive questionnaire. Within the limits of the present paper, only the following questions are considered: Two close-ended questions inquired about how students learned during the real-scale project, as opposed to ‘traditional studio projects,’ and how they would compare the two projects; four open-ended questions asked about the positive and negative aspects of the real-scale project and ‘traditional studio projects’; and another one asked whether during design learning, students preferred individual work or group work, and the reason for their choice. The responses to these questions are discussed below.

Figure 4. Real-scale installation of a group of students within the mock-up enclosure. Transformation of seasons (left: Winter; right: Spring) by changing the shadow lengths, orientation of objects, and the intensity, source and color of lighting.

Figure 5. 1/50 scale model of a student representing two different lighting configurations for the set design of an international popular song contest.

a. Learning by Doing and Seeing: Responses to the questionnaire conveyed that the students felt that they learned more and felt more excited about the real-scale project than regular design projects. There were many comments about how they learned to use light, how they started perceiving the relationship between objects and light better than before, and how they learned about materials and detailing. One student mentioned 'I definitely felt space in all its three dimensions, and that it was very good to be able to see your thoughts realized'. Another said: 'I grew an interest in lighting design; I even designed special lighting configuration for my home; I can say this project taught me how to use light'. Overall, the comments indicated that the real-scale project helped them to 'learn by seeing', and that it was more fun and exciting compared to regular projects. However, as mentioned above, they frequently mentioned that the project was more costly and time consuming. Some felt they needed more time with the mock-up application so that they could improve their designs. Finally, many students mentioned that the real-scale project was very useful in acquiring lighting knowledge, to be practiced in the later phase (international popular song contest set design) (**Figure 5**).

b. Learning with Different Techniques: Student evaluations of the first two phases, both of which were group-works, indicated that students learned using different methods in the two projects. Most students mentioned that in the first phase (traditionally handled backstage project), they learned by critiques, doing research and drawing; whereas in the second phase (real-scale project), they learned by discussions with their friends, working directly on the mock-up application, and working on scale models. Hence, it seems that the introduction of the real-scale project was successful in bringing different learning styles into practice, which enabled more students to learn in a way that was suitable to them. This is evident in one student's words about the real-scale project: 'For the first time I felt really connected to the project; compared to other projects, it definitely increased involvement and effort'. When asked about traditional design projects (involving scaled drawings and models), students mentioned that they were useful, directly relevant to their professional lives and more productive than the real-scale project, but admitted that such projects feel dull at times, and that they tend to overlook

design details. One student stated, 'Traditional projects often make me feel detached from school'; yet another one mentioned that traditional projects 'restrict our creativity because of the intensity and pressure'. It seems that combining the two approaches may be the most beneficial. In fact, one student stated, 'After the set design (real-scale) project, I started noticing the positive aspects of traditional design projects more clearly'.

c. Learning in a Group: Evaluations for group-work seemed to be quite positive, although only one third of the students stated that they generally preferred group-work to individual work. This may be because of difficulties in adapting to the third phase (international popular song contest set design project) in which they worked individually. Even though some students stated that group-work was useful for their professional lives in the future, others criticized it, stating that some group members lacked responsibility, that there were disagreements among group members in making design decisions, and that it was difficult to get organized. However, the positive evaluations for group-work suggest that even though the students had to face the challenges of group-work, in general, they may actually have enjoyed working out solutions for design problems together. Many students mentioned that it was beneficial to resolve problems that arose due to differences of opinions. As one student stated, in group-work 'others support you, help develop each other's ideas, and it brings confidence to have them near you'.

CONCLUSION

In concept, *real-scale* as referred to in this paper, could also be read as *real time* (in the sense that it is employed in virtual environment terminology) in terms of its contribution to design understanding and development. When design models initially emerged in virtual space, they aided in comprehending design elements as if in three dimensions and as they would be like in reality. Also, implementing, displaying and changing design ideas on a virtual model proved to be easier and quicker once the designer got acquainted with the software (Şenyapılı, 1999). But, a stronger impact came along with the notion of *real time*. Virtual models allow for aspects that are difficult to practice on a scale model, and offer the possibility of interacting with the design in real-time 'as if it was (or was being) built' (Şenyapılı, 1996). When implications of actions follow instantaneously, it is possible to comprehend the chain of cause-and-effect, and hence the experience becomes *real* (Krueger and Morgan, 1994). Similarly, whatever real time interaction means in a virtual environment, so may *real-scale* in a design environment.

Within this framework, the real-scale project described here was successful in multiple ways. First, the use of the real-scale helped students to design, construct and redesign by focusing on details, as well as letting them see the effects of light, color and texture in a real sized space. Second, the use of real-scale, as well as working in a group have provided students with different learning styles, allowing them to work the way they prefer, instead of limiting them. As indicated by some of the responses to the open-ended questions, group-work also made some students more aware of their responsibilities not only to themselves but also to the group. Third, the connection of the projects, comprising the real-scale exercise, has proven successful. The students learned about the design of a performance set gradually; first through researching, then by constructing and observing, and finally, by bringing the pieces together for a real life project. One student

acknowledged this aspect by saying: '…in the third phase of the project, I was excited because I really felt as though I was the actual designer of the set of the international popular song contest'.

To sum up, this paper argues that a combination of real-scale projects (focusing on lighting and surfaces) with traditional (scaled) ones would serve well for future interior design studios. As such, students may not only be more productive in generating designs, but perhaps, more importantly they may raise more questions about their own work. As for the studio instructors, through a real-scale exercise, it becomes easier to point out problems and then test solutions by actually building up. In the presented study, the increased motivation, which comes with variety of scales and working methods as well as the contemporary nature of the projects, assisted to improve learning in the design studio. Moreover, working in real-scale seems to give students a chance to peer into the construction part of design, toward which they might otherwise feel alienated. After all, "What students make is more important than what they think they are making" (Kratzer, 1997, 35).

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Anahtar Sözcükler: gerçek ölçek, tasarım eğitimi; yaparak öğrenme; sahne tasarımı; sanal modellemeler.

GERÇEK ÖLÇEĞİN DENEYİMLENMESİ: BİR SAHNE TASARIMI PROJESİ

Günümüzde yaygınlaşan sanal modellemelerin getirdiği avantajlara karşın gerçek ölçekte öğrenmenin faydalarının tümüyle gözardı edilmemesi gerekir. Bu faydaların altını çizmek amacıyla öğrencilerin ışık, renk ve dokuyla çalıştıkları gerçek ölçekli bir iç mimarlık stüdyosu projesi hazırlanmıştır. Gruplara ayrılan öğrencilerden gerçek ölçekli bir hacim içinde malzeme, renk ve ışığı kullanarak bir sahne tasarımı gerçekleştirmeleri istenmiştir. Bu makale sözkonusu projenin öğrenci algısına dayanan bir değerlendirmesini içermektedir. Değerlendirme üç ana başlık altında toplanabilir: Yaparak ve görerek öğrenmek, değişik öğrenme yöntemleri kullanmak ve grup içinde öğrenmek. Gerçek ölçekte çalışmanın tasarım eğitiminde ortaya çıkarabileceği mekan ve bütçe gibi zorluklarına değinilmekle birlikte, inceleme sonuçları doğrultusunda, gerçek ölçekte yapılacak basit bir çalışmanın bile öğrencilerin projenin hayata geçiş sürecini kavrayışına katkı yapabileceği savunulmaktadır.