

Project Selection in the Design Studio: Absence of Learning Environments

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Abstract

Project selection is an essential matter of design teaching. Based on observations of a specific curriculum, the author claims that a wide repertoire of subjects including offices, restaurants, hotels, and other public places are used to prepare design students, but that schools and other “learning environments/schools” are similarly ignored. Considering this, the study unfolds reasons why interior design studios do not assign “learning environments” as design projects. Moreover, it analyzes a specific learning environment, in terms of its considerable scope and adequate complexity, as a design problem.

Key words: *architectural design, design education, learning environments.*

Design studios, where students integrate various topics of curriculum into their design proposals, play a fundamental role in curricula of interior and architectural education (Jones 1996; Lange 1998; Gürel and Basa 2004; Goldschmidt and Tatsa 2005; Kvan and Jia 2005; Hinson 2007). Design students are expected to consider social, cultural, historical, environmental, aesthetic, and technical aspects while developing their individual proposals of an assigned subject. Theoretical and practical components of interior and architectural education are usually assumed to be interrelated in the design studio. The fundamental role of the design studio stems from the fact that it is the place where the theoretical knowledge becomes alive (Norberg-Schulz 1997).

The origins of the design studio and its management can be traced back to École des Beaux-Arts (School of Fine Arts) in Paris, the most significant architectural school in the 19th century (Banham 1960). In the beginning of the 20th century, École des Beaux-Arts' strict and classicist approach to design (Colquhoun 1986; Antoniades 1992; Littmann 2000), which dictated certain principles of plan organizations and



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form compositions, was replaced by a variety of approaches. Modernist understanding of architecture of the early 20th century reacted to École des Beaux-Arts conceptions and methods, and emphasized different educational techniques (Johnson 1994; Westfall 2008). New teaching models are still being developed in response to the changing contexts and conditions (Wake and Levine 2006; Oxman 2008; Huges 2009), but the project-based system, which was introduced by École des Beaux-Arts, seems to sustain its power as a foundation for the interior and architectural schools.

Research and case studies, critiques, pre-juries, and a final jury, through which the initial design ideas transform into detailed projects, direct the design process in the studio. Within this process, functional and spatial considerations are enhanced by concerns ranging from building structure and construction and three-dimensional perceptions, to selection and placement of furniture and accessories, as well as effects of color, texture, and light (Pile 2007).

Interior and architectural design can be viewed as a creative problem-solving activity and a fundamental means of inquiry by which students give shape to ideas of settlements (Rowe 1991). According to Rowe, design problems promote open-ended solutions, which are associated with new insights. He stated that the design problem-solving activity involves both evaluation of the past solutions and generation of new approaches.

Interior and architectural design problems, both in professional practice and in education, need freedom of thought and expression (Gregotti 1996). This is not a state of being unconcerned with the existing conditions. On the contrary, the actual circumstances are central to the design process. They are recognized and critically analyzed as the context, within which essence of the certain function (such as dwelling, working, learning, etc.) of the design project is materialized. Creative design practice, as Gregotti pointed out, requires viewing the empirical world in order to modify and overturn it, but also to open a critical dialogue with it.

The realization of space articulation through a certain project embraces numerous aspects. Design problem-solving activity is not merely a technical or artistic response to spatial problems. Interior and architectural design is rather an intervention to the existing system and to the conventional look at the *function*. Creative procedure of each new design proposal constructs a critique of that certain function. In line with Gregotti's (1996) view, this reasoning leads one to regard interior and architectural design more as a problem of knowledge and a new description, and less as a construction activity. It is clear that diversity of architectural solutions in the project-oriented design studios encourages new perceptions of the project subject. Depth of connection between the subject and the design studio goals relies upon the capacity of the subject in terms of promoting original and creative spatial organizations. A generative design problem, in this respect, should provide a commendable level of substance that can transform into spatial conception and architectural expression.

In interior and architectural design studios, students meet with various project subjects during their education and consideration of a design problem. A wide repertoire of project subjects, including hotels, houses, offices, restaurants, libraries, museums, pavilions, theaters, cinemas, and exhibition halls, are used. However, this ostensibly rich

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repertoire excludes the subject of “learning environments/schools.” Although schools, from kindergarten to university, shelter the essential human activity of learning, they are rarely included as a design problem in the agenda of interior design studios. The influence of the physical environment—and especially the influence of the interior design elements—on student learning, behavior, and achievement are apparent (Huse 1995; Tanner 2000). Thus, the design studios’ unwillingness toward including the subject of learning environments/schools in the repertoire is worth debate. Along with exploring the reasons behind this exclusion, this study addresses and discusses validity of the learning environment as a generative design problem.

Within this framework, all the project subjects in the second-, third-, and fourth-year design studios that were assigned during a 12-year time period (1997–2009) within an interior design curriculum were inspected, and coordinators of design studios (spokespersons for a team of design instructors) were individually interviewed. In addition, a specific learning environment at an international elementary school was observed throughout one academic year. Through interviews and questionnaires, the opinions of both the students and teachers are analyzed. To avoid being trapped by generalizations, the study focused on a first-grade classroom and analyzed its major space and subspaces. The aim was to reveal that even a single classroom has a complicated nature to be considered as a design subject. No doubt, classrooms of each grade carry their own specific issues. Accordingly, together they offer a complex network on which to focus, when the public spaces, circulation patterns, outdoor areas, and their experiences and uses by the students are considered (Lindholm 1995; Malone and Tranter 2003; Elsley 2004).

Finally, this study examines why learning environments/schools receive little attention in interior and architectural design studios. It calls design instructors of the studios of interior design and architecture schools to consider that learning environments/schools are not less complex in terms of spatial organization than the present subjects in the prevailing repertoire. It is important here to underline that this study raises its criticism according to the particular conditions of a certain curriculum; thus, the suggestions may not be generalized for all design studios. Yet, it provides a platform for discussion and further study of the subject of how and where design students learn.

Project Selection in Design Teaching: An Attempt to Expand the Repertoire

It is obvious that project selection is essential to the agenda of interior and architectural design studios. The selected subjects play a specific role in the design process and act as a predominant component of the design work (Bovill, Gardner, and Wiedemann 1997). Within the project-based education of the interior and architectural profession (Cunningham 2005), subjects can be considered as the educational mechanisms that prescribe and assign some spatial and formal possibilities, and indicate choices of appropriate materials, finishes, fixtures, design details, lighting, and other elements.

However, the role of subject cannot merely be identified with its appropriateness in current design studio and design teaching models. The selected subjects reveal the design instructors’ ideas, feelings, and concerns about the special realms of interior design practice since the design studio is usually thought of as an educational model

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for professional practice (Cuff 1991). In other words, the subjects offer a picture of the pre-assumed commissions that the interior design graduates will confront later in practice. Similarly, the missing ones in this picture are assumed to be out of the focus of interior design. This raises a critical question: According to which educational and professional validity is this precept formed? Furthermore, it is relevant to ask why learning environments/schools are ignored by the instructors of the design studios, although the influence of the physical environment (such as color, material, texture, patterns, lighting, acoustics, ceiling height, partitions, and furniture design and layout, which are all central to interior design issues) on children's perception, learning, and behavior has become the concern of a plethora of empirical and theoretical studies (Weinstein 1987; Legendre 1999; Read, Sugawara, and Brandt 1999; Maxwell 2000; Gifford 2002).

Method of Study

This study is composed of two main parts: In the first part, the study investigates the subjects of the given projects in the design studios and consults the coordinators' (or design school professors') views upon the learning environments/schools as a subject of design projects. In the second part, it checks the viewpoints of elementary school teachers and students with an aim of presenting the potential merits of the learning environment as a generative design subject.

Investigating Projects and Studio Coordinators' Views

In order to test the soundness of my observations upon the absence of the subject of learning environments/schools, a set of given projects in the 12-year period of 1997 through 2009 were examined in the interior design curriculum of Bilkent University in Turkey through the project briefs and archives.

In order to deepen the research, interviews with the present and former coordinators of the interior design studios were conducted. The interviews investigated which design subjects were selected as design problems in the design studios. The coordinators were asked whether learning environments/schools were assigned as design subjects in their studios within the period examined. The interviews were intended to depict the thoughts of the coordinators and design instructors about the status of learning environments/schools as potential design-problem subjects.

Initial Findings. All of the project briefs of the design studios were examined, case-by-case, in terms of the subjects of the given projects in the study period. Documents (including photographs and slides of the projects for each semester) of the department's archives were inspected for the same purpose. The research showed that learning environments/schools were not selected as the project subject of the design studios throughout the years examined. This is a noticeable paradigm because various projects were assigned as a design problem over the 12-year period. Some design problems were given repeatedly over the period reviewed. The range of subjects varied from a governor's house to a winter leisure center, from a museum to a boutique hotel, and from a theater to a cultural center. This wide variety of subjects sharpened the question as to why learning environments/schools are kept out of the interior design studio repertoire.

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The design studio coordinators confirm the diversity of the subjects that are acknowledged as design problems used by students. Their responses to the question of whether learning environments/schools were assigned as design subjects in their studios offered a clear-cut result that neither in second-year interior design studios, nor in third- or fourth-year studios, the subject of a learning environment/school had been selected as a term project.

The interviews demonstrated that the design instructors do not find the substance of learning environments/schools suitable for the agenda of an interior design studio. This agenda is consistent with the development of creative design thinking ability by students of the interior design studio. The comments of the coordinators of different classes indicate that the absence of learning environments/schools as interior design projects within the examined curriculum is primarily grounded upon a certain conclusion. It is considered that learning environment/school projects do not allow or stimulate as much creative space organization and form arrangement as do other design problems. Their explanations pointed out a concern that artistic and creative attributions, which greatly appeal to interior designers, may not be realized in learning environments/schools design projects.

An interior design studio coordinator stated, "Whereas creativity is important in interior design education, school projects do not provide elaborate spatial organizations." She believed that the arrangement of classrooms does not allow flexibility, and that user profiles of the schools, students, teachers, and parents are limited in terms of fulfilling the complex requirements of the design process. Another coordinator pointed out that "School projects do not supply challenging spaces in terms of interior design." An important aspect underlined by the design instructor was that the content of school projects pertained to *architecture* rather than *interior design*. She remarked that the subject of school is not "juicy" enough for students. In addition, some coordinators mentioned that the scale used for children's spaces may bring extra difficulty to the program of the interior design studio. One coordinator raised the concern that design students may have superficial tendencies under the influence of the *preconceived preferences* of children, such as primary color choices or childish forms, that may limit design choices.

Findings of this phase of the study demonstrated both the resistance of interior design studios to the subject of learning environments/schools and the reasons behind this academic resistance. The second phase of the study inspected how sound these reasons are. Are they grounded upon critical observations and research on contemporary education in terms of its spatial cognition? Is it possible that the omission of learning environments/schools is connected with the design instructors' conventional images of past schools? Can these reasons sustain their validity while many reforms and changes are being experienced in the field of elementary, middle, and high school education (Bell et al. 2005)?

Research in an Elementary School

The inspection of the given projects throughout the years reviewed for this study and the evaluation of the views of the design coordinators placed this study in a stable position. The explanations of the design coordinators not only reveal the omission of

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the subject of learning environments/schools, but also signify the educational goals and expectations of the design studio. Consequently, it is relevant to test the soundness of the reasons behind this tendency. It is also pertinent to examine the competence of the learning environments/schools as design problems that allow design students to interpret aesthetic, social, and technical aspects (Rowe 1991) of the given task.

Space planning is especially critical in learning environments where various activities take place. Creation of innovative educational environments (Brown 1992) is one of the key subjects of elementary, middle, and high school education. It is vital that learning environments should be created considering the issues of safety and security. Creation of healthy and sustainable environments with proper materials, ventilation or air conditioning and heating, lighting, and sound is also of great importance.

Another important subject is the achievement of effective classroom management for the successful instruction of children. Effective classroom management, which is examined through several studies (Brophy 1983; Doyle and Carter 1984; Richardson and Fallona 2001; Garrahy, Cothran, and Kulinna 2005), is certainly a multifaceted concern. Effectiveness of the teaching methods, relationship between students and teacher, academic and disciplinary rules and regulations, and many other factors have to be considered under the very broad concept of classroom management. Within its general conception, however, the significant role a physical environment plays cannot be undermined. The spatial characteristics of the learning environments have the potential of affecting both the students' manners and a teachers' way of reaching their educational and intellectual goals. In this respect, learning environments can be considered as design problems of interior and architectural design studios within which creative design proposals are made and differing solutions are produced (Rowe 1991) in order to obtain innovative educational environments (Brown 1992). Regarding these considerations, the following study carried out in an elementary school, the International School of Berne, Switzerland, aims to present the potential merits of the learning environment as a generative design subject.

In their research, exploring teachers' feelings about their work, Moriarty et al. (2001) illustrated the importance of the early years' particular position in education. Many of the early years teachers pointed out that young children need to learn through practical experiences and activities, which should necessarily be supported and facilitated by an appropriate physical environment. From first-grade classrooms inspected in recent studies in terms of the emotional and instructional dimensions of quality (Wilson, Pianta, and Stuhlman 2007; Stuhlman and Pianta 2009), it is apparent that space allocation is significant for all the grades, and first-grade classrooms are especially important. This initial step to education becomes one of the factors that determine the future attitudes of students toward their educational institutions.

Within this understanding, this study focused on a subspace of a first-grade classroom in order to show that even a modest space organization may develop a conceptual design thinking process. It is specific to the realm of learning environments that realization of minor spatial design ideas may address major issues in learning and teaching activity. The study conducted in the elementary school aimed to test and verify this suggestion.

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Through the verification of this suggestion, the review attempted to encourage reflections in the project selection process of the interior design studio.

There is a strong relationship between classroom settings and students' behavior and engagement in activities (Bennett, Elliot, and Peters 2005; Rimm-Kaufman et al. 2005). The classroom should be recognized as a complex architectural formation in terms of its interacting relationship between space and function. Its spatial characteristics tend to produce positive (or negative) effects in the learning process. Based upon this hypothesis and recognition, the study investigated the effectiveness of a specific space organization. In particular, it explored a subspace (named "special corner") in the first-grade classroom of an international elementary school. Students who demonstrated high standards of performance in certain subjects (or students who completed their coursework on time; who respected fellow students, teachers, and environment; or who exhibited such traits as cooperation and helpfulness) were rewarded with time in the special corner area of the classroom. This modest, but creative, subspace used to reward and motivate the students was initiated, designed, and furnished by one of the first-grade teachers as an important ingredient of her classroom management and instruction.

The study endeavored to elicit opinions of both teachers and students about this special corner, as well as the physical characteristics of the classroom through individual interviews and a questionnaire, respectively. Two teachers from each grade (kindergarten and Grades 1 and 2), who possessed many years of teaching experience, were given questionnaires that allowed them to write their additional comments. The questionnaire was composed of six questions. The first question sought to clarify the thoughts of the teachers about the effects of the space organization on the learning environments and the learning capacity of the students. The second question sought to define the special corner (a small and modest subspace—complete with toys—that was designed and furnished to motivate the students for learning and positive behavior.) Further, the questionnaire attempted to find out if the special corner accomplished its specific objective of rewarding achievement and good behavior. The third question investigated whether the existence of such a reward space may create any discrimination among students. The fourth question sought to depict the teachers' ideas of whether rewarding students with such a space served to motivate enhanced student learning or studying. The fifth question asked the views of the teachers about involvement of such subspaces in the first-grade classroom. The last question investigated their opinions on whether such a subspace should be part of classroom settings as contained in formal interior and architectural design projects. The teachers also were requested to write out their additional comments about the subject and the spatial concerns.

The objective of the questionnaire was twofold; first, to find out teachers' viewpoints and thoughts on the effects of space organization on the learning activity of students; second, their approaches to the use of a special corner in terms of its academic effectiveness.

Twelve first-grade students were individually interviewed to explore their feelings and thoughts, both on the subspace named the special corner in their classroom and their classroom in general. The interviews were conducted face to face, by special appointment

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with each student. The first two questions investigated whether they enjoyed being in the special corner when they were allowed to do so. The third question asked how they felt when they were in that area. The fourth question sought to discover the motivation capacity of the special corner for the children, asking the students whether they studied more to be allowed to go to the special corner. The fifth question asked if they think that they are special when they are in the special corner. The last question related only to the other subspaces in their classroom, with the objective being to discover the student's favorite places in the classroom.

Secondary Findings. In the study carried out with the teachers, it appeared that they all strongly agreed with the importance of space organization in learning environments. They strongly agreed that space organization of the learning environment affects the learning capacity of students. Their responses to the question about the effectiveness of space on learning activity, as well as their written and oral comments on the subject, displayed the comprehensive viewpoints of the teachers. They seemed more concerned about the possibilities of classroom design based on its implications for better, creative, and independent learning processes. Responses to the questions about the special corner indicated that reward areas must be carefully considered. Only one of the teachers agreed that the special corner accomplished its specific objective. In response to the third question, the majority of teachers claimed that such reward spaces may create discriminatory situations and interactions among students. Responses to the fourth question also indicated that, with the exception of one teacher, they did not believe in the effectiveness of the special corner as a motivating factor for student learning and studying. However, they all agreed that such subspaces might be included in first-grade classrooms only if allowed to be used by all students.

One of the teachers indicated that a play area should be an integral part of the first-grade curriculum and space, rather than being just a reward for successful completion of more formal tasks. In response to the last question, a majority of the teachers agreed that such a subspace should be designed as a part of the classroom setting in interior architectural projects. On an interesting note, three of the teachers felt the necessity to mark a difference in their minds between the special corner, which is initiated as an agent of classroom management, and the subspaces existing elsewhere in the room for other or different curricular activities.

Though the questions were created to elicit the views of the teachers about the special corner, they nonetheless felt compelled to make additional comments about the effectiveness of the subspaces within the classroom in general. As one of the teachers highlighted, small areas for different activities enable the students to concentrate well; thus, such areas are especially helpful when teaching children of this age. According to her, offering children of this age a space that warmly bridges the student and learning activity seems to be more crucial than the expectation of an academic achievement through a specific space organization. Interestingly, the individual comments by teachers yielded a common thought: They all offered support for separate areas for different activities and special interests, such as a quiet reading corner, as well as areas for a nature study, a computer, creative writing, construction and design, play, and art. They expressed the

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belief that such areas can enhance the learning activity. Almost all the teachers stressed the need for small spaces in the classroom where students can work independently on a variety of subject areas. Two teachers underlined the importance of flexibility, which is an important spatial concern of interior design. According to their view, classroom space needs to be flexible to allow a wide variety of learning to take place.

The study carried out with the students concentrated on two major issues: first, the effectiveness of a special corner; and second, their favorite places in the classroom. The underlying aim here was to examine the children's understanding of space organization. The findings offered a view into the students' sense of space regarding their classroom. Their responses to the questions revealed their awareness of the spatial organization of the classroom and their active engagement with the physical setting. Responses to the first question show that all students are rewarded with the special corner during the year due to various achievements, efforts, and behaviors. Their expressions demonstrated, however, that some students visit the area more than others. Responses to the second question indicated that, with the exception of one student, they like to be in the special corner. In response to the third question, students stated that they felt good and happy while playing in that space. Only one student offered, "I don't feel so happy, because I'm alone there." Another student stressed that if it were open (the special corner is defined by small pieces of furniture, blocks, and fabric), it would not be that attractive. He said, "I am both out and in the classroom when I'm in the special corner." His spatial comment and awareness seems to be very challenging for his age.

In response to the fourth question, a majority of the students pointed out that they study more in order to gain more time in the special corner. Differing from the teachers' view that it may create discriminatory situations, none of the students expressed a displeasure about not frequently being in the special corner. Responses to the fifth question show that the students feel special when they are in the special corner as a reward for a good coursework or friendly, appropriate behavior. Responses to the sixth question indicated that the students all have favorite places in the classroom. Four students preferred the special corner, three students preferred the shop-decorated subspace, three students preferred the computer corner, and two students identified their own desks as their favorite places in the classroom.

Similar to the teachers' view, the findings from the student responses showed their pleasure with the subspaces in the classroom. Their willingness to make short, but honest, comments about their favorite places, as well as their capacity to differentiate the space qualities in terms of form and function, allows one to trace how students may benefit from well-designed learning environments. Moreover, their feelings indicate the evidence of aiming uniqueness and identity in the design of learning environments, rather than being satisfied with impersonal spaces.

Despite the negative attitude most of the teachers expressed toward the reward area (special corner), the students, even those who were rarely rewarded with access to this area, did not reflect negative feelings. They still aspired to spend time in the reward area. Findings from the interviews with the students, therefore, indicated that the examined subspace accomplished its objective of motivating the first-grade students to study

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more and learn. By looking at their responses, it is possible to say that the first-grade teacher's classroom management is supported by this modest spatial and functional organization.

From the research, it may be concluded that a variety of subspaces within the classroom and for different activities are appreciated by the first-grade students. Another important issue is that even a very modest spatial articulation may produce a positive effect in the learning process and in classroom management. Moreover, it has the capacity of changing the feelings or moods of a student. In this respect, students' attitudes can be influenced in a positive manner toward learning activity and education through well-analyzed and contemporarily established design decisions. The relationship between space and learning activity appears to offer a wide and meaningful research area for design students, if they are assigned such a subject in the interior design curriculum.

The findings demonstrate that both teachers and students have particular thoughts and feelings about the space organization of the classroom. As the "user profiles" of the learning environments, they all approach the subject with a critical mind. Teachers are very conscious and concerned about the space-function relationship. Likewise, despite their young ages, a majority of the students seem to be aware of the spatial quality of their learning environment.

The findings confirm that the physical shaping of the space is one of the fundamental factors that affects their academic achievement. It can be assumed that the relationship between space and function in learning environments comprises significant complexity and noteworthiness. This identification is of great importance. It supports the assignment and the status of learning environments as a design problem, in addition to the preferred design subjects already used in the interior design studios. In other words, neither students nor teachers are less informed, less interested, or less conscious in terms of space quality than are restaurant or hotel guests. Further, nothing suggests that school spaces deserve less attention spatially, formally, and functionally than the restaurant, office, hotel, or museum spaces.

Results of the study in the elementary school confirm the suggestion that learning environments can be selected as appropriate design subjects, as they own the necessary complexity and scope required by design studios and individual designers. Furthermore, it involves a user profile with a critical and innovative understanding. This confirmation legitimizes the position I took: Learning environments should be included in the repertoire of design subjects in interior design studios.

Discussion: "Learning Environment" as a Generative Design Problem

This study examined why learning environments receive little attention by interior and architecture design studios as a design problem. It attempted to move the cognitive block in academia and call to attention of design studios of interior and architecture schools the generative nature of learning environments as a design problem.

Space organization plays an important role in determining human activity. Learning, as one of the essential activities, is affected to a great extent by the spatial formation. It

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should be clearly understood that schools can no longer be perceived as merely a convention of classrooms, public spaces, and corridors. Classrooms are changed into learning environments that are enriched and supported by special areas hosting different activities, such as quiet reading, creative play, and computer use. These areas may have varying purposes—as increasing academic achievement, establishing effective classroom management, and providing comfort to the student—yet, all aim to create positive influences on the learning activity. As a design educator in an interior architecture curriculum for many years, I suggest that, regardless of these considerations, learning environments are not (or rarely are) recognized as a design problem. Lack of interest is confirmed by viewing the selected project subjects of design studios. As the research illustrated, it is because “school” is still being perceived as a simple convention of classrooms, public spaces, and corridors, which may not contribute to the education of the design student.

While many other disciplines perceive and discuss the learning environment as a fundamental issue (Al-Soliman 1999; Douglas and Gifford 2001; Vosniadou et al. 2001; Blatchford 2003; Rogers and Price 2004; Hassrick and Schneider 2009), the field of interior and architectural design hesitates to give it similar importance. Although the field of design celebrates the multitude of research for its own learning environment (Schön 1984; Baird 1999; Demirbas and Demirkan 2000; Ochsner 2000), it interestingly ignores the educational spaces and learning environments, overall, as a design problem in its curriculum. In this respect, it is important to remember that selection of design subjects in the design studio is not important only from the design-teaching point of view. It is also important toward ensuring that young and future designers, as well as design instructors, (re)think and (re) conceptualize the selected subject because design for any specific function requires active inquiry and research (Chi 2007; Furján 2007; Varnelis 2007). In this sense, learning environments will be observed, analyzed, discussed, transformed, and reformed through their spatial aspects, within the process mechanisms of the interior design studio. The subject matters, such as quality of teaching and learning, classroom management, student achievement, importance of educational activities, and development of participatory learning, will be conceived from the architectural standpoint. This architectural standpoint certainly will bring a fresh view and future vision to the current discussions on education.

Thus, studying learning environments as design problems in interior design studios will have a twofold contribution. First, it will reinforce the field of interior design curriculum through its generative and complex nature as a design subject. Second, it will strengthen the general field of educational studies (McCulloch 2002) by focusing on the spatial aspects of learning environments and carrying it to the platforms of design teaching and thinking.

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