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## Teaching creativity in self-organizing studio network: implications for architectural education

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### Abstract

Design education is traditionally developed for those related to creative arts such as artists, art object designers or professionals who search for new ideas in their designs. It is considered as a domain to awaken “creativity”. Creativity is discussed as a function of human brain and mostly interpreted in its psychological context. This paper discusses the social characteristics of an education medium for creativity in terms of a network theory. This model of design education, in which the studio group is regarded as a network, proposes that by setting up the primary underlying framework, students ultimately reach a common ground through their individual learning experiences that lead to a wide range of design variations. Consequently, this open-ended process helps enhance the students’ independent problem-solving and innovative thinking skills. “Awareness”, “information exchange”, “role defining”, “continuous interaction” are related concepts in such a self-regulating interactive process of searching for creative solutions. The process will be studied under the light of recent discoveries on brain that are connected to the network theory. These ideas will be presented and illustrated through a case study of freshman design exercise implemented at Okan University Department of Architecture, İstanbul, Turkey. This learner-centered pedagogical framework can contribute to a theory of learning that can capture and convey the essential features of a metacognitive environment.

*Keywords: Design education; learner-centered teaching; network-based studio environment*

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### 1. Introduction

The purpose of design education is to provide a framework for teaching young minds the skills to become active agents in shaping their environment. Design education helps learners discover new ways of perceiving the world, free from the limitations of the profession. In fact, it can be restated as discovering creative ways of looking at, analyzing and interpreting real life. Through structuring an unbounded teaching pedagogy students are motivated to undertake an active role and are ultimately led to discover their own accurate solutions. This kind of a dynamic learning process will instigate “creativity”. In this domain creativity is defined as being receptive to new experiences and resistant to ambiguities (Anderson, 2005). Critical thinking may stimulate students to think out of the box, and, in return, to problematize a world seen. This way of thinking will most definitely reflect in their designs and ultimately in their professional work. Creativity requires two modes of analyses: thinking and making. Hence, the critical question is how to promote thinking and making simultaneously in design education?

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The design studio, as the core of architectural education, presents new ways for conceiving the world from a progressive point of view, free of any boundaries; thus promoting intellectual growth and critical thinking. It is claimed that as a pedagogical method, design studio has no comparable model relative to its intensity and involvement (Deans of the Consortium, 1981). In contrast to typical lecture method of teaching, studio teaching actively engages students, both at the analytic and synthetic inquiry phases. Yet, inquiry is still regarded as a method by the majority of design schools and not a state of mind (Lyndon, 1982).

This article argues that an integrated model of design teaching and learning based on learner-centered pedagogy and network approaches may prove fruitful for developing a scaffold both for critical thinking and creativity in design education. This learner-centered pedagogical framework can contribute to a theory of learning that can capture and convey the essential features of a metacognitive environment. The pedagogical goal should be to nurture a studio culture in which students learn through an interactive learning environment; students instructing students, sharing information, distributing expertise. In this way, it will be possible to foster curiosity and imagination in design, motivating students to explore and encouraging them to think and criticize.

## **2. Conceptual Framework**

There has been a growing interest in creativity by education communities –nationally and internationally– in the last decade. In his widely read book, *A Whole New Mind*, Pink (2005) argues that the fundamental skills acquired by today’s designers –holistic thinking, imagination, creativity, active learning instead of passive learning– override the traditional analytic skills. In support of this shift, design educators are in search of a new educational approach to bring analytic, synthetic, and evaluative modes of thinking into design studios. It is argued that success now depends on the randomly interactive exchange of information which is no longer disseminated linearly (Vertosick, 2002). This theory is also reflected by Kress and Leeuwen (2002) who claim that we are undergoing an epistemological shift from a monomodal and linear system dominated by the book and writing, to a multimodal system characterized by the spatial organization of different modes. Thus, there is an explicit need for a transformative design pedagogy, particularly with regard to the nature of teaching, the roles played by the participants in the activity, and the way social structures are shaped. This paper presents a studio model which implements such a pedagogical stance and discusses the application of a design project based on the learner-centered teaching philosophy and network-based learning environment.

### *2.1. Learner-centered methodology*

Learner-centered describes a teaching methodology in which, as opposed to traditional format of teacher-centred methodology, students actively participate in the process (Norman and Spohrer, 1996). This pedagogical approach emphasizes the importance of active learning over passive learning. In learner-centered teaching, students are no longer passive receivers of knowledge; instead, they are “active participants in learning and co-constructors of knowledge (Meece, 2003). Learner-centered teaching philosophy is developed through in-class strategies that encourage students’ participation in decision-making, problem-solving, and knowledge-acquiring. Consequently, it requires continuous interaction with the learning process, encouraging students’ reflection, dialogue, and engagement. The interactive environment between instructors and students facilitate the learning process through discovery, inquiry, and problem solving (Law, 2007). Hence, the redefined role of the student promotes self- and peer-assessment skills as well as critical thinking abilities within social relationships animated by dialog and reciprocity. Research underlying the learner-centered principles confirms that learning is nonlinear, recursive, continuous, complex, relational, and natural in humans. Research also shows that learning is enhanced in contexts where learners have supportive relationships, have a sense of ownership and control over the learning process, and can learn with and from each other in safe and trusting learning environments (McCombs & Whisler, 1997). However, the role of learner-centered teaching has not been investigated fully in design education. The design project discussed in this paper is intended to recognize this gap by utilizing a learner-based approach in design teaching.

## 2.2. Network-based learning environment

A large number of social, biological and man-made systems can be represented in the form of networks. For instance, the society is made by individuals connected by social interactions (Wasserman and Faust, 1994) while critical infrastructure systems, such as the Internet (Pastor-Satorras and Vespignani, 2004) or a subway system (Latora and Marchiori, 2002) can equally be modeled as a network. This network-based model bears upon the “Hopfield net”, one of the milestones in the field of neural networks proposed by John Hopfield during the 80s. Hopfield nets are ensembles of independent units behaving as an elementary system in interaction with the rest of the ensemble (Rojas, 1996). The most crucial aspect of this research is that most of the studied networks shares common properties and that they are guaranteed to converge to a local minimum. This model holds great promise for alternative teaching pedagogies when considering the potential for self-organization in learners. The underpinnings of Piaget’s ideas share similarities with Hopfield’s “network theory”. Piaget (1970), who has exerted a strong influence on educational methodology, emphasizes continuous interaction with other people as the key aspect of educational learning and places the notion of dynamic system with feedback at its heart. Similarly, the Durkheimian view asserts that the exposure to a wide variety of different viewpoints and activities is the essential prerequisite for the social construction of individualism (Durkheim, 1933). It is argued that diversity and conflict arising as a result of social exchange will have a positive, catalytic influence on students learning. Hence, studio environments that allow this ‘co-operative competition’ will provide rich knowledge ecology to be drawn upon.

## 2.3. Integrated Approach

As an alternative to the classical approach to design teaching based on teacher-based learning methodology, we experimented with a transformative pedagogy for the design studio based on the learner-centered teaching philosophy and network-based learning environment. This studio marks a different pedagogical stance regarding how learning methods and social relations are structured in order to facilitate a creative approach among students. This can be illustrated by the following two points.

First, the pedagogy facilitates a productive environment that is defined by the synergy of students and their various behavioral patterns. This new environment shifts the monopoly of the control from the instructor to the students, thus granting them a more active role in the design process. Such an approach involves a reallocation of power in the classroom although it is clear that the ultimate control still remains with the faculty instructor. Shifting social dynamics encourage students to critique one another, and to think critically about their designs. Methods like brainstorming techniques, mutual discussions and group critiques all help to facilitate this learning. Structuring a reciprocal, equalitarian context, whereby students have to rely upon one another for guidance, support, and criticism, is central to this process.

Second, this transformative model requires a densely knit clump of social structure in which the group of students is regarded as a network. “Awareness”, “information exchange”, “role defining”, “continuous interaction” are related concepts in such a self-regulating interactive process of searching for creative solutions. This kind of a network environment generates a collective consciousness which is independent of the subjective individual intellect but derived from the collective intellect. Similar to Hopfield networks, the studio works as an ensemble of independent individuals behaving as a collective system. In this way, what is produced by the students as meaning and knowledge bears a collective identity, a common language that is engaged critically, individually and collectively. Hence, the outcomes of this collaborative network are expected to share similar properties.

This transformative model seems to overcome some of the limitations associated with the traditional teaching methodologies. Conventional teaching models prescribe sequential thinking methods. However, neither human mind nor the collective intellect works in a linear cognitive system (Vertosick, 2002). A nebulous, procreative pedagogic model has the potential to nurture an effective learning and critical thinking by bringing alternative perspectives and interdisciplinary concepts into the design studio.

## 3. Designing the studio

Derived from the above-mentioned pedagogical platforms, a 4-week design exercise was assigned in 2011 Spring Semester in the Basic Design studio composed of first and second year students at Okan University Department of

Architecture, Istanbul, Turkey. Students were asked to develop a pavilion design informed by the nine-square grid problem, developed by John Hejduk at the University of Texas in the mid-1950s (Caragonne, 1995).

In a typical nine-square grid problem exercise, students were given a pre-existing nine-square grid which served as an abstract framework to elaborate spatially through the addition and arrangement of architectural elements (such as planes, piers and walls). As opposed to the classic nine-square grid exercise, we included a small program to instigate the architectural process. The pedagogical objective of this studio exercise is two-folds: first; to develop an understanding of qualities of architectural space and different space-defining elements; second, to teach how to distill and communicate the most optimal design solution to the design questions and problem as set out by the brief (or program) and expanded by the student. The design project was conducted by three different instructors in three parallel studios consisting of an average of 35 students each.

The brief was the same for all studios, yet each studio instructor guided her own studio group through her own in-class strategies. Thus, the end results of each particular studio share similar characteristics among themselves in line with the dialogue conducted with peers and the instructor while reflecting explicit differences in-between individual studios. However, since all studios share a common set of design guidelines introduced at the beginning of the exercise, it is not surprising to observe that the end-results display some similarities between groups as well. The aim of this experimental teaching pedagogy was to develop a studio environment which would nurture dialog. A fundamental precondition of dialog requires a non-authoritarian system that favors equality of participant. As Paulo Freire argues, "The mark of a successful educator is not skill in persuasion-but the ability to dialog with educatees in a mode of reciprocity" (Goulet, 1973). Such learned-centered in-class strategies, which encourage students' interaction with the content, with the learning process, and with one another and the teacher, encourage students' reflection, dialogue, and engagement; hence, require a critical standpoint on their part. Thus, the instructor is invited to take part in the process when required. In sum, we believe that developing a non-authoritarian pedagogical framework that emphasizes social relationships within the studio is crucial for facilitating dialog and critical engagement to a significant degree in this experimental model.

### 3.1. Process/Production, Program and Design Rules

The process of the exercise included two main stages: *analytic and synthetic modes of inquiry* actively interconnected and developed through a process of serial iteration. In the analytic inquiry phase, students conducted research on precedents relative to the designated program, and refined their 'problem statements' to guide them in the next step. At the beginning of this phase, a theoretical lecture was offered by the instructors to provide relevant background on the subject and to instigate brainstorming through class discussions. In the synthetic inquiry phase, students developed systematic design thinking and making through serial iterations that tapped into their personal interests and insights, while still employing rational methods and communication.

In order to make composition and the elaboration of a compositional schema the motive for design thinking and making, the brief of the exercise was kept minimal: a new *pavilion* design for individuals and groups to *spatially practice: pass by/through gather in, look at/from* etc.). The specifications for the pavilion were as listed: (i) the final pavilion will consist of *volumes of space*; (ii) the entire pavilion will consist of *27 cubical modules*; (iii) 9 squares of 5x5 m somehow defined and located *within central courtyard* on campus; (iv) sub-volumes of at least 3 different *size aggregates* of cubic modules. In order to stimulate the students during the design process, they were asked to select a guiding question from Bernard Tschumi's (1990) "space questions" to augment the design problem. We decided to enrich the exercise to include the corporeal world and specified a real site within the university campus. In this way, the design problem included a contextual variable which provided a motive for invention.

As we were setting the design rules, we paid attention not to limit the theoretical sophistication of the current design exercise, the design education at later stages and eventually the design profession in practice. The rules introduced were as listed: (i) the final design has to stay within the limits of the suggested cube; no protrusions are allowed; (ii) every design move needs to function in one or more ways –the design of the pavilion needs to be efficient; (iii) all design moves must be in orthogonal angles to one another.

#### 4. Projects produced

During this brainstorming phase, the role of the instructor was to provide feedback in terms of questions “on-call”. Studio critiques were in the form of collective critiques or desk-critics as needed. A collective studio lecture on “Pavilions as Spatial Activators” and “the Architectural Design Process” offered by all instructors opened up questions about how one can think creatively within the framework of a specific task. During the production phase students kept a record of their design moves through freehand sketches on tracing paper and made three-dimensional study models systematically solving for the design problem. After determining the most articulate, multivalent, analysis-supported scheme or synthesizing a final one, they were asked to take photographs of their final models.

Students started questioning the notions of objective social space and subjective inner space. They investigated architectural and compositional elements affecting perceptions. Some of the students’ designs were concerned about man’s spatial experience defined by the relationships of spatial volumes. Hence, alignment, transparency, permeability, layering, stratification of spaces, and geometric alignments emerged as topics of discussion throughout the design process. As can be seen in the following project examples each studio’s responses to these issues greatly differed from each other. While some of the projects acknowledged the simple geometric order of the 9-square frame, some considered it as a neutral game-board on which elaborations were explored. The following three projects (Figure 1a-b and c) exemplify the outcomes of Studio1, 2 and 3 as shaped by the instructor’s feedback and students’ participation that are collectively attempted.



Figure 1a.  
STUDIO1 (Rahmi Bilge)  
individuality of space

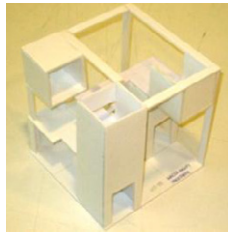


Figure 1b.  
STUDIO2 (Hacer Aksoy)  
transformation on framework  
hierarchy of existing grid

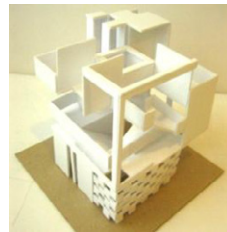


Figure 1c.  
STUDIO3 (Can Turan)  
implied space achieved through  
minimal means for creating spatial figure

These design projects indicate how a collaborative learning environment, where students and instructors engaged critically the content and the social structure, led to different outcomes across 3 studios yet reflecting the collective intentions of the individual group. The common denominator of these designs is their attempt to keep the cubical volumes intact while employing transformations on form. Each student investigated different spatial relationships to articulate space. Albeit each design demonstrates a different range of enclosures, these works affirm a general predilection among Studio1 (Figure 1a) towards acknowledging the integrity of the cubes. It is apparent that these students considered the design problem one of pure composition exercise rather than of space creation for bodily experience. As described above, the concept of boundary was one of the most intriguing issues brought up by the students. Studio2 picked up this issue and reflected on the role that boundaries play in defining space (Figures 1b). This group reflected on the ways in which both literal and virtual boundaries can be articulated through the interplay between hollow and solid horizontal frames. The selected examples mirror a common scheme: defining the limits of the suggested cube while distinguishing one part from the other through the extensions and deformations of the boundary system at the same time.

The specific character of designs developed in Studio3 embodies the concept of “immediately experienced space–space as observed by the moving body (Figures 1c). As can be seen in these selected project, the main concept of Studio3 was the notion of progressive perception of space achieved through space-time continua. The minimal rules of the exercise ensured an abstract architectural language based on the dialectic between the frame and other space defining elements, prioritizing the syntactical relation between forms. This instigated architectural process and liberated students from other issues, such as the relation between construction technique and form, iconography and symbolism.

## 5. Conclusion

Overall, we have found that non-authoritarian teaching pedagogy, which is based on the notions of self-assessment and consensus decision-making, has been indispensable for the nurturing of dialog and critical thinking in the learning process. Characterized by a learner-centered teaching philosophy and network-based learning environment, the design studio starts with the subjectivities and interpretations of individual students. However, because the studio is an interactive environment, the assertion of one's own point of view confronts that of the larger group. Students learn to make decisions with others who disagree with their values, and by necessity, develop the mechanisms, both verbal and graphic, to expose and explore different opinions. The role of the instructor is to “help the students recognize the ideas and theories that were embedded in their work or make explicit their own ideas, or reflect about their own work and thinking in a way that would help the students understand the discovery-invention-production-processes (Argyri and Schon, 1974). Instructors need to lead students to think freely but through limitations and strict rules, in order not to confine the design experience. This kind of a pedagogical stance will have a positive, catalytic influence on students. The above-described design projects indicate how such a learning environment, where students and instructors engaged critically the content and the social structure, led to different outcomes across three studios yet reflecting common traits –a consensus– in-between each group. While Studio 1 reserved the individuality of the cubes, Studio 2 investigated with extensions and deformations of the neutral framework while preserving the hierarchy of the pre-existing grid. On the other hand, Studio 3 focused on the creation of implied spaces, defined through minimal means for creating a spatial figure. The outcomes of each studio reflect the collective intentions of the specific group. In addition to raising creativity in design, this studio model instilled critical consciousness based upon reciprocity.

## 6. Note

The formulation of the studio programme belongs to the author, Ayşe Özbil, but we collaborated with Kıvanç Kılınc in the running of the course. We would like to thank him for his valuable contributions and support.

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