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Basic design dilemmas in architectural education

Ali Asasoglu*, Sengul Oymen Gur and Sengul Yalcınkaya Erol

Faculty of Architecture, Karadeniz Technical University, KTU Mimarlık Fakültesi, Mimarlık Bolumu Trabzon 61080, Turkey.

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The conflicts of modern times demand high levels of creativity from the architect. Creativity, with all its social and physical connotations and implications, should therefore be the guiding concept in the revision of architectural education. The basic design course, which is deemed to foster creativity, plays an important role in the education of architects. Approaches of the mentors of this course vary. However, the progress under any of these approaches that students make in conceiving and solving architectural problems creatively has never been tested. This study focuses on the conceptual approach in basic design courses and successfully demonstrates that students (irrespective of their inborn talent levels) learn creative modes of thinking that are highly important in practicing architecture.

Key words: Design education, conceptual design, creativity, evaluation, basic design course.

INTRODUCTION

There are several dilemmas facing architects today. On the one hand, the demand for liveable environments requires that humanitarian values remain an integral part of architectural design. On the other hand, in the Late Capitalist era both human communication and architecture have been reduced to an impoverished sign language, the universal language of money, which will likely continue to confine the social system. These contradictory and conflicting concerns aggravate the responsibilities of architects today, and render their tasks more difficult than ever by requiring a totally different logistics in architectural practice and education. The discipline must revise its theoretical structure and implementation processes and must also devise serious remedies in education. The conflicts and conundrums of modern times demand high levels of creativity from the architect; the success of architectural solutions rests on the metaphor by which the oppositional states are resolved as forms in the imagination of architect-designers. Creativity, with all its social and physical connotations and implications, should therefore be the guiding concept in the revision of architectural education. The basic design course, which is deemed to foster creativity, plays an important role in the education of architects. Some educational philosophers might argue that creativity is congenital, and that it cannot, therefore, be taught. It may be true that talent, inclination, intention and determination help to realise creativity at an early age, but through conducive and eliciting teaching methods anyone can be sensitised towards a rich variety of ideas, outside influences, knowledge and creativity at a proper age (Bruner, 1963; Illich, 1970).

Medawar posits that “Creativity is a rapid intuitive deduction, which owes its power to the infirmity of our powers of reasoning, an illumination, or a kind of awareness, or yet a generative act in architectural discovery, which obviates an image of a fragment of a possible world… That creativity beyond analysis is a romantic illusion we must outgrow. It cannot be learned perhaps, but it can certainly be encouraged and abetted” (Medawar, 1969: 57). Although, the part played by tacit knowledge in intuitive leaps that precede the rigorous construction of knowledge in architecture is not fully understood, most design researchers agree upon the assumption that designers arrive at brilliantly rewarding solutions by way of analysis through synthesis. Creative designers somehow know when an idea is the right one (Davies and Talbot, 1987). Elements of solutions emerge

*Corresponding author. E-mail: asas@ktu.edu.tr, asasoglu@hotmail.com. Tel: +90 462 3772682. Fax: +90 462 3255588.

very early in the design process (Agabani, 1980; Eastman, 1970; Lawson, 1997). Architect's reasoning is based on some synthetic and formative design idea rather than on the analysis of the problem (Rowe, 1987). In short, these authors imply that architect-designers experiment with solutions as soon as they conceive of a design problem, rather than merely following methods. Broadbent (1973) used the term "preconceptions" in alluding to the guiding principles preferred by architects. Darke (1978) contended that a simple idea, the "primary generator", is used by designers to narrow down the range of possible solutions to a design problem. She claimed that primary generators do not merely get the design process started but have an influence throughout the whole design process. In most cases primary generators are even detectable in the solutions (Lawson, 1997).

Schon (1983) preferred the term "generative metaphor" which parallels Wittgenstein's "seeing-as" principle. It implies that architects are framing the problem situation and reflecting their visions upon it. This statement sounds very convincing. However, Schon's "metaphor" refers to a social consensus that the entire society is able to decipher (Bourdieu, 1985), which is not always the case in architecture. Architectural design is an individualistic and personal activity. In practice, architects may have idiosyncratic values and metaphors that guide their design activities. What architects actually work with are visio-spatial concepts with depth of coverage and explanatory power. This is called "right brain thinking" and is characterised by a distinct, holistic, visio-spatial approach (Bogen, 1969). Architectural design education is supposed to enhance this capacity of the architect-to-be by creating effective milieus, known as design studios.

Design studios

Architectural education consists of two main bodies of knowledge, the verbal and the practical. In the design studio, the student is expected neither to recite back the theories of architecture nor the strength of materials; rather, he or she is expected to understand a problem fully and to devise a solution. Thus, the student must observe, speculate, reflect and discover. Broadbent (1973) classified design strategies as "typological, canonical, analogical and pragmatic". The first strategy is based on historic plan syntaxes, but changing times render them outmoded and design turns into mimesis. The second strategy relies heavily upon geometry, forms, ratios and axis systems, and so forth, as stipulated in the canons of the leading architects of their time. The third strategy is based on an analogy between the problem and the outside systems or objects, that is, the bird-like TWA building (Trans World Airlines by Eero Saarinen at J.F.K. Airport, New York). The fourth strategy implies a requirement list based upon the needs and desires of the people involved in the act of building: sponsors, financiers, users, and so forth. Choosing among these design strategies seems arbitrary and circumstantial. The strategies in themselves do not illuminate what is going on in the mind of the designer, nor do they ease a choice. What leads a designer to a final choice of strategy is a complex question that remains unanswered. However, it is clear that the process requires a certain level of creativity. No course teaches architecture students unbridled, unrestrained thinking except for the basic design course. The goal of this course as underlined in the curriculum of almost every school of architecture is to foster creativity. Instructors take different approaches in leading this course: while the methods and techniques employed are certainly creative in themselves (Designtrain Congress Proceedings, 2008), they all emphasise some discrete learning process.

Basic design studio

In basic design courses at architecture schools, students are encouraged to visualise the world around them in various ways. Generally, students' work is criticised in terms of internal consistency, percept-image-affect relationships, and instruments of expression and representation. Approaches of the mentors vary. Some are rather conventional: they still use basic Gestalt principles (Gurer, 2008). Some ascribe concepts to spaces and deal with design process step by step (Tuncel et al., 2008). More frequently, instructors will start with a concrete problem and expect students to solve it experimentally with different materials (Temple, 2008; Cubukcu and Eksioglu, 2008; Kiessel and Abbasoglu, 2008; Turkyilmaz, 2008; Kurtuncu et al., 2008). Most mentors develop very creative starting points for abstraction such as photographs or textures and aim at preparing students to think abstractly and creatively (Dougan, 2008; Allo, 2008; Bedette, 2008; Potamianos, 2008; Yaghan and Ashour, 2008). Some simply throw up concepts to be represented by the students to get started (Ozek and Dalgiç, 2008; Emir and Duzgun, 2008).

Demirbaş (2008) conducted a survey among architecture students to see how students evaluate the difference between the experimental approaches and the conceptual approaches of the mentors and found that students declared the approaches had been of equal benefit. However, the progress under each of these approaches that students make in conceiving and solving architectural problems creatively has never been tested. Both approaches profess (either openly or latently) that students, while being trained in representation and expression techniques and ways to playfully deal with abstractions, also discover and develop creative ways of thinking. Proving this assumption is difficult. It requires that each student can be closely checked in the following years and can be observed in his/her design moves and products. Furthermore, the results of such research will be neither conclusive nor satisfactory because many factors may play roles in the success of an architecture student: appreciation for the mentor, his/her feeling for the specific design problem under consideration, his/her emotional state, family problems, and so forth. Therefore, it is very difficult to come up with results that are both reliable and scientific. Nevertheless, some approximation can be made. Before getting into the details of how this can be done the reader should be familiarised with the way the basic design course is run in the authors' school.

SOME NOTES ON THE RESEARCH CASE

At Karadeniz Technical University (Trabzon, Turkey) mentors of the basic design course tend to start with concepts not necessarily related to architecture. This approach requires considerable creativity. Mentors' choices are predicated upon the conviction that conceptual learning is a powerful learning technique in design disciplines, especially in architecture.

Conceptual learning

Conceptual learning in architecture means learning by inquiry via “visio-spatial” concepts. Instead of concepts originating from the known theories of architecture, students deal with a priori concepts. Like philosophers they work with a series of inquiries, reflect critically on the problems, and think in terms of figurative properties of concepts. They wander on the boundaries of organised thought and penetrate into emotional thinking. Such inquiries may link to both conceptual and perceptual values of architecture, and may even embrace “otherness”. Even the past may gain imagery substance in this line of thinking. Conceptual learning, as adopted here, is discovery-oriented and influenced, in particular, by Einstein’s heuristic inquiry. Speculation, imagination and heuristic methods that are employed in his studies are powerful soft techniques of empirical inquiry (Einstein, 1998; 1949; 1954). The breakthroughs Einstein established in physics can only be explained by deep sensitivity, and his accurate assessment of the implications of the physics problems before him. For instance, while he was formulating his renowned relativity theory he employed Maxwell’s equations. These equations were replete with powerful implications waiting to be understood, and Einstein deciphered them. Einstein did most of his research by contemplating and reasoning rather than working in the laboratory, which helped enrich his power of prediction. To sum up, Einstein’s contributions to his field were the result of incredible speculation and imagination.

The lesson resulting from Einstein is that efficient speculation and valuable imagination are necessary assets for the growth and progress of any discipline provided that they are based on a deep understanding of the empirical content and context of the discipline. This observation also implies that knowledge gained from conditional learning, observational learning and reflective learning should be brought into play effectively, particularly during the advanced design studios. The basic design course may also help students in “changing the aspect” which is a feature of Wittgenstein’s philosophy where he employs the terms “seeing” and “seeing as” (1953). Changing the aspect is very critical in creative thinking. If one is uncritically immersed in the individualistic theories of the masters of architecture it becomes very difficult to look at the problems from different viewpoints. But if one thinks via an infinite world of concepts one can easily change his/her mind for the better.

Concept

A concept is primarily the object of philosophy. The first principle of philosophy is that universals such as nature, space, existence, entity, humans, presence and absence, life and death reveal nothing: they themselves need to be revealed. Thus, as opposed to the scientific hypotheses, concepts do not have variable or invariable properties (Deleuze and Guattari, 1996). A concept touches tangentially on a problem plane without which it is impossible to define it. On this plane, it has neighbours with which it forms relations in addition to its interactions with the plane itself. Its entanglements with them are procedural and processional. In other words, they change and transform with time. Consequently, Concepts do not have space-time coordinates. They have intense ordinates, instead. Therefore, they enter into very complex interactions with one another by merely rambling in space/time. Concepts have revelations such as percepts, images and affects (ibid.). These help to form semiosis (the stand-for relation) in architectural thinking.

Philosophical concepts are of substance, not matter, but they can be materialised. Hegel (1837), for instance, has defined figures as the material properties of concepts. When concepts are intuitively transformed into figures in the mind, they become images. Every image is a re-creation of a concept in the human mind. In this respect philosophical concepts sometimes coincide and/or overlap with artistic concepts. Yet this happens only when concepts have ability to erupt in “affects” or when “affect” concepts can materialise themselves in artistic minds” (Hegel, 1837).

Concepts in architecture

While philosophical concepts operate solely in the field of immanence artistic figures operate in phenomenal compositions. Architectural projects, for example, operate in a variety of domains: on the noumenal plane (ideas and concepts), compositional and representational planes (sketches, drawings, models, computer screens, outputs, etc.), and eventually on a phenomenological plane in the physical environment. Most abstract concepts can be transformed into formal concepts by creative minds. Quite a number of abstract “percepts” and corresponding “affects” have been envisioned by recent architects and have materialised in recent architecture.

Percepts are neither the mental simulations of momentary perceptions nor do they necessarily refer to phenomenal objects. Percepts are cognised versions of reality-mental simulacrums in the schemata cast by conventions, classical masterpieces of literature and other arts, scientific developments, historical and cultural knowledge, and so on. Even if percepts resemble objects this is something coincidentally produced by their innate potentials. For example, if we speak of the percept of man, what comes to mind is not the mental image of someone we have just perceived, but a bio-cultural entity which has gone through many transformations throughout history. When this is put on paper as a composition about man, for example in a painting, it is not even reality any more. It is composed of line, brush marks, colours, materials, shadow and light (ibid.). Affects are not momentary emotions or sensations, either. They are hereditary instruments of feelings that are discernable, distinguishable, and describable (ibid.). Just like words, phrases and idioms in spoken language affects may have been created and developed by individuals on an arbitrary basis (Kuhn, 1970). By usage they have become recognizable patterns. In music, the octave and D-minor are examples of affects, while voices and words are affects in language. In architecture, materials, colours, light, shadow, lines, planes, masses and the omnipotent space that fills the background of everything are affects.

Administration of the course

In the first part of this course the relationships between precepts and affects are investigated in terms of origin, type and certainty, and discussions rely on discursive tools such as proximity, reflection, comparison and sympathy relations adopted by Foucault in his analysis of concept/word consistency (Foucault, 1994). Syntactic, semantic and aesthetic values of compositions are also criticised during the discussion sessions. Despite the fact that some researchers recommend unconstrained thinking with respect to creativity, Fisher argues that social and architectural memory is a significant tool for thinking in terms of solutions (Fisher, 2004). Therefore, in the second part of the course where a thematic project is targeted, the appropriateness of concepts proposed by the students in relation to the problem at hand is also incorporated into the critiques.

The first week’s exercise is designed to think in terms of random general concepts, for which there are no givens. The second assignment sticks with the same concepts and also emphasises the “line” as a tool. The third proposes the use of three-dimensional volumes as the tools of expression and presentation and the concepts offered to students are usually action verbs. Sub-concepts related to activities gain in importance. The fourth assignment deals with current discourses, mostly based on the 20th century philosophers and design theoreticians who have influenced the course of architecture theoretically in the last quarter-century. The concepts derived from the main philosophical discourses include the following: flow and continuity, comprehend and cover adjacency and co-bordering, controversy and opposition, centrality and marginality, reversal of hierarchies, difference, limits, outside and inside, etc. The fifth can be summarised as “within the within”; it involves the concept of “voids” in general and implies perforations of the facades in particular. The sixth is a study on the free combination of planes and solids, again involving some interesting concepts and small thematic compositions, and so on.

These exercises are not meant to directly relate to concrete architectural problem situations but they have the potential to be picked up as design concepts in the future. Some concepts expounded in the beginning of the course are presented here to clarify the research for the reader. These are “other”, “growth”, “deep”, “wind” and “family”. “Other” in the simplest sense of the word is that which differs from the majority and which is generally met by opposition. Sometimes, as Heidegger posits (1927), the abstract majority can be the other, depending on where one stands in a society. But “others” usually have properties in common. These properties can be observed in the student's work shown in Figure 1. “To grow” and “deep” were the most preferred concepts from the second set of concepts. Concepts almost automatically associated with growth were increment, progress, development and metamorphosis of living organisms as programmed by nature. Images related to these concepts included the mirroring of a series of gradual increases and changes of size, substance and matter. The type of relationship pointed to similarity in the form of relative increases. In the example rendered below, the student represents the movement of living organisms. Composition is enhanced by some imbalances, probably malignant growth signs, expressed by formal elements (Figure 2).

Another student treated growth as a concentric man-made process. Hierarchical growth has been realised as a simulacrum in the form of proportionately inlaid saucepans (Figure 3). “Deep” was expressed with its cognitive properties and figurative features by the majority of students. For one of them, “deep” is far away

Figure 1. Other (by Ahmet N. Satı).

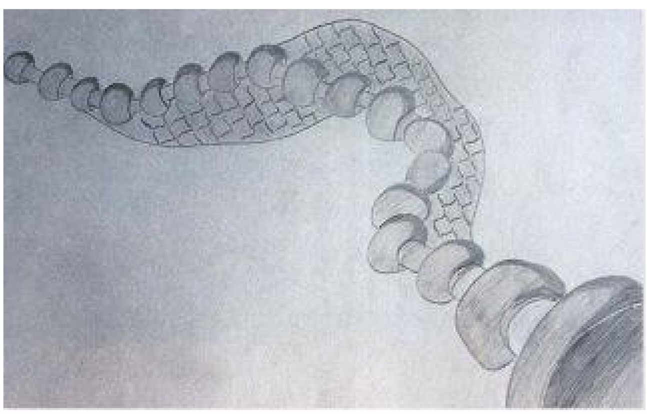

Figure 2. Growth (by Sevcan Usta).

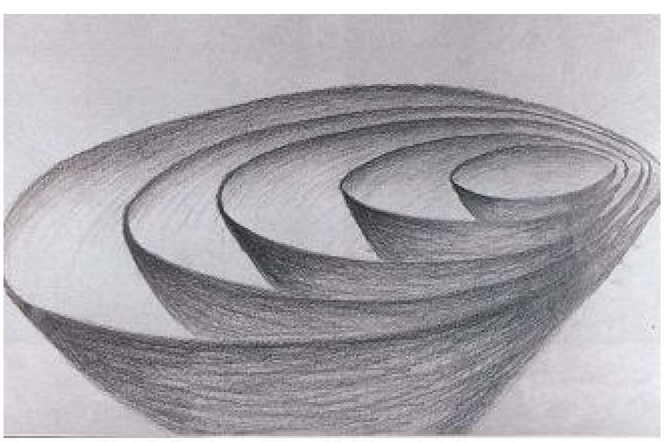

Figure 3. Growth (by Umut Sevinc).

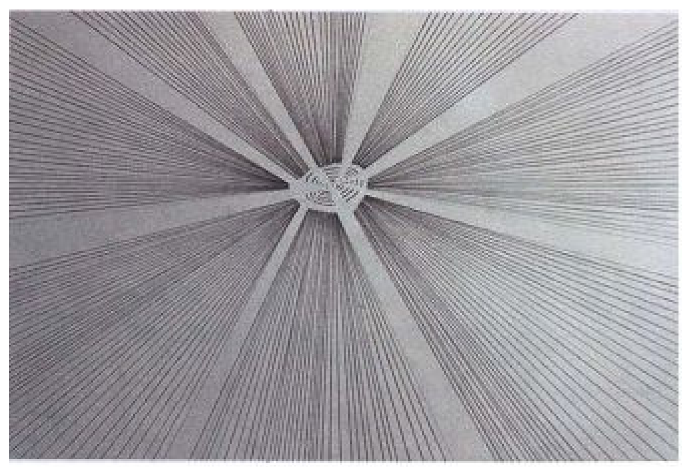

Figure 4. Deep (by Semih Danisman).

and can only be perceived from a certain perspective. Lines adjoining and closing in the horizon point to a remote location “deep” in the image (Figure 4). “Deep” may also be a bottomless well and it may be very scary (Figure 5). The metonymy between “deep” and dark is reflected by the darkening focus of the composition. This connotes indeterminacy and suspense. Uncertain strings are probably used as themes of tension and fear. In another example, shrinking spirals join remotely to indicate how distanced the “deep” place is from us (Figure 6). Another representation relies heavily upon organic analogies. By pointing to the veiled privacy of the centre of a plant, the image alludes to the mystery involved in the "deep" (Figure 7).

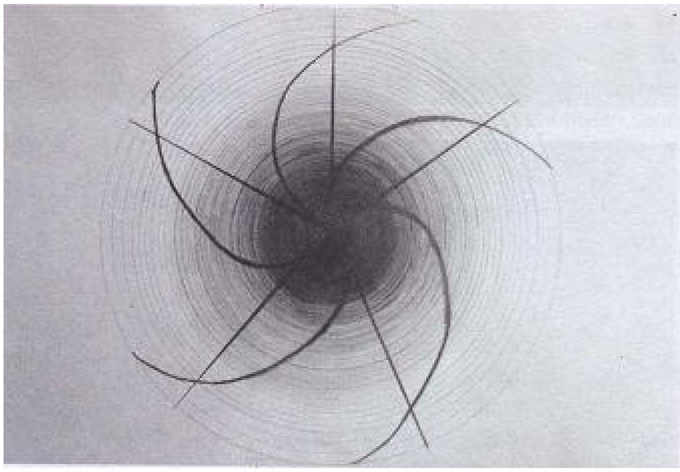

Figure 5. Deep (by Sinan Duz).

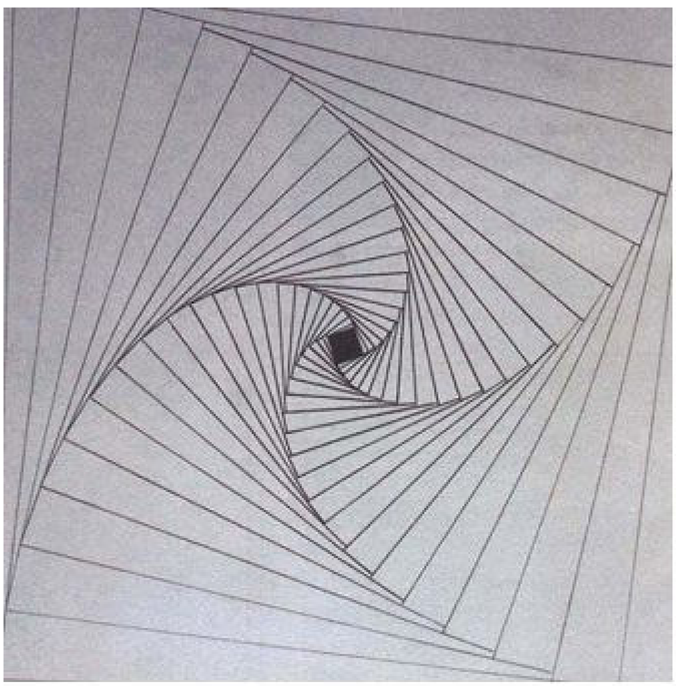

Figure 6. Deep (by Bahadır Yalcın).

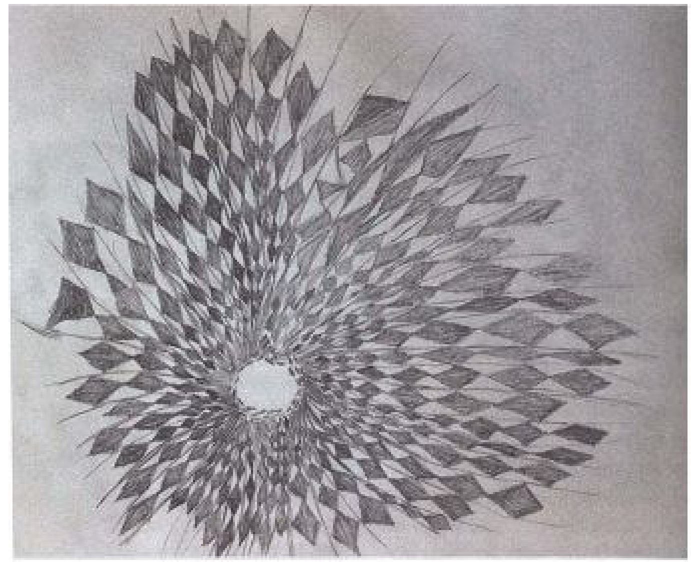

Figure 7. Deep (by Serkan Ulutas).

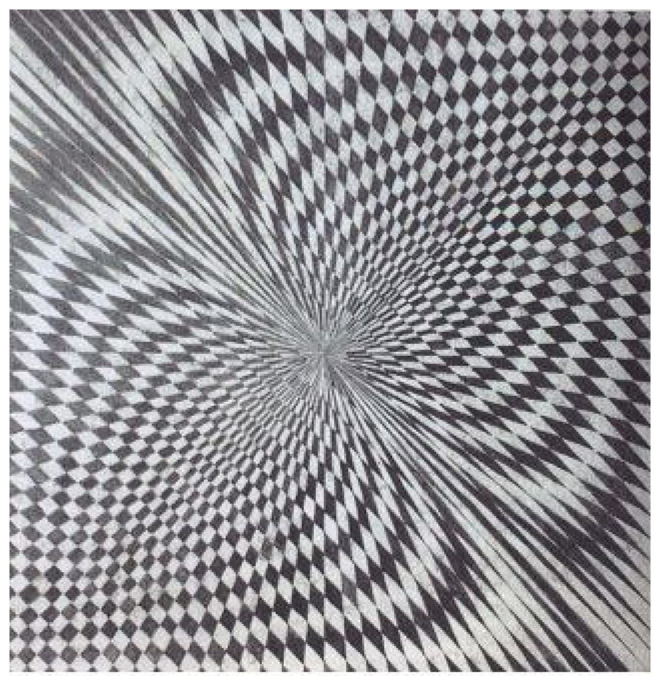

Figure 8. Deep (by Sukran Aymelek).

In another drawing "deep" is a reality that cannot be perceived by the naked eye; it is an illusion, in fact. Stratified and diminishing light effects produce this cognitive image of the "deep" (Figure 8). In the last example "deep" is far away, stratified, indeterminate, and most importantly, relative to where one stands. "Deep" is perhaps the chaotic order of societies in which we are immersed. It may be the grand chaos itself. Here, the multi-faceted and rhythmic whole is thoroughly allegoric. The relationship between the concept and its representation is based on "sympathy". The meaning is left for the observer to decipher (Figure 9). "Wind" was the least chosen but best exemplified (Figure 10). What is wind? It is a draught that is dynamic and flowing: it touches and then curls away by leaving a shudder and cooling effect behind. Dynamic and organic lines are close to it. Clustering resembles it. Wind makes itself felt by severing and departing from the stability and solemnity of the vacuum embracing it. We notice wind because it contrasts with an otherwise calm, subdued, empty and cataleptic experience. The origin of relationship between

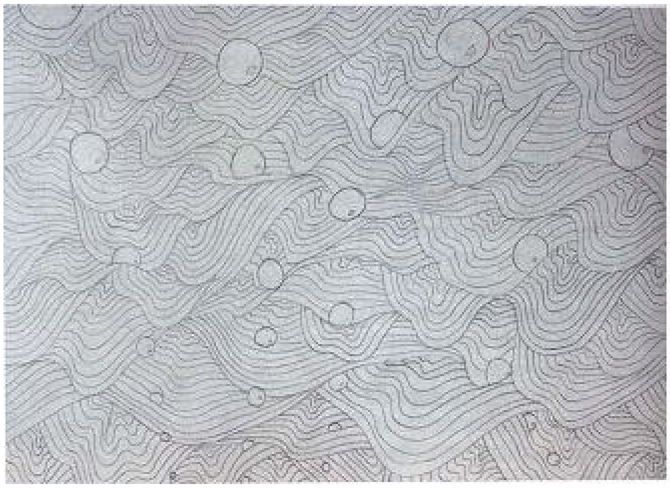

Figure 9. Deep (by Ayse F. Colak).

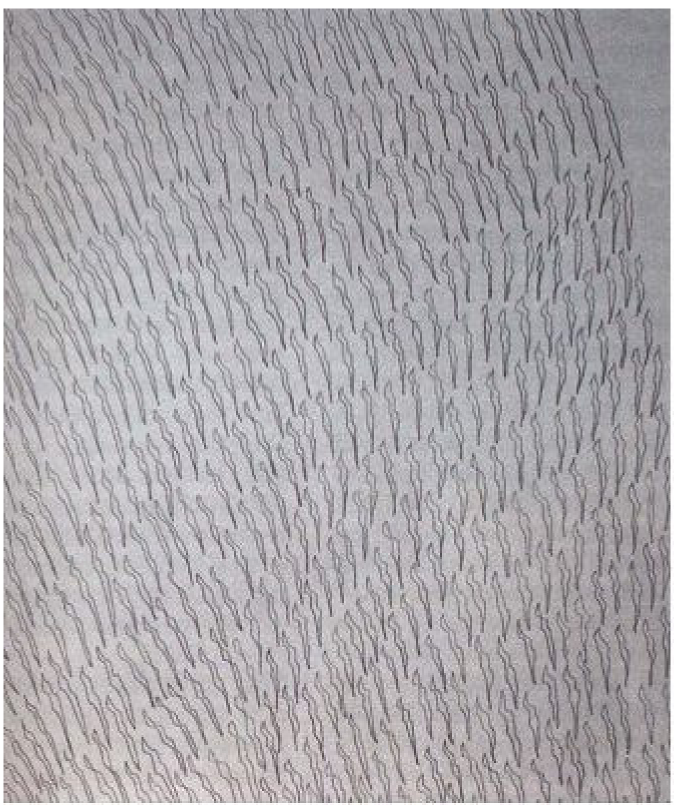

Figure 10. Wind (by Rabia Celebi).

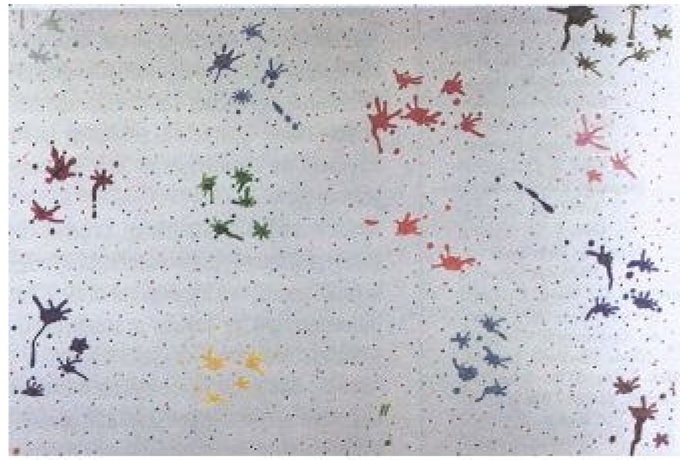

Figure 11. Family (by Beyza Evirgen).

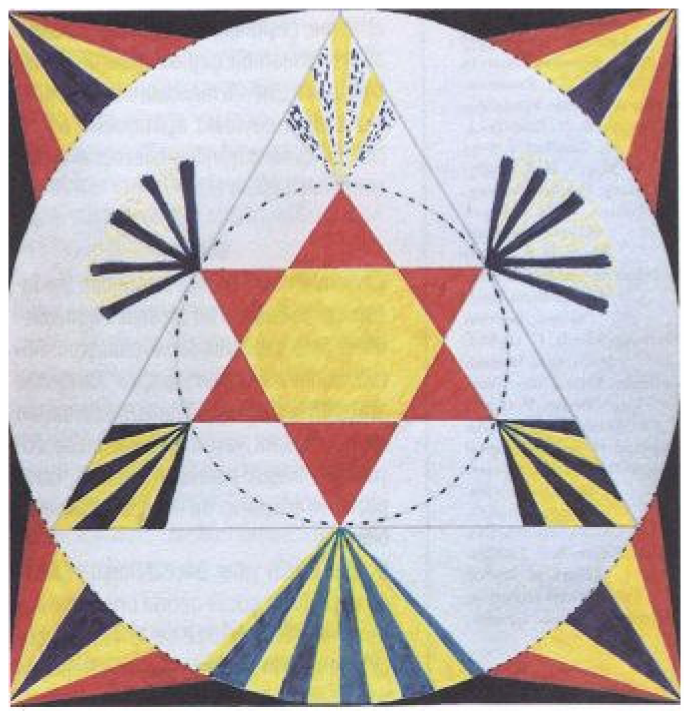

Figure 12. Family (by Muhammet Eksioglu).

its cognitive features and its simulacrum is difference. The type of relationship can be identified as modulation. The power of the relationship is the internal congruency of the representation: dynamism. Compositional elements are chosen from among the affects of the wind percept. The student's work is astonishingly impressive. "Family" was the most frequently chosen concept. Family structure and unity, as well as the presence of different age groups in a family were reflected through different-sized and different-coloured geometric forms in the compositions and configurations of students. Organic structure and form of familial ties, variations of family structures within societies and the internal cohesiveness of families were reflected with appropriate forms, colours and textures by students (Figure 11). Complex representation of family disputes and contradictions along with peace, harmony, interdependency, confidentiality, privacy and security in the same composition, via concentric mandalas was remarkable (Figure 12).

Table 1. Descriptive statistics.

	Mean	Std. deviation	N
E2	54.41	11.052	101
E3	55.15	9.860	101
E4	55.79	14.929	101
E5	65.30	17.188	101
E6	65.54	15.826	101
E7	67.67	11.886	101

Table 2. Tests of within-subjects effects.

Source		Type III sum of squares	Df	Mean square	F	p
Factor1	Sphericity assumed	18960.891	5	3792.178	27.441	0.000
	Greenhouse Geisser	18960.891	3.878	4889.095	27.441	0.000
	Huynh-Feldt	18960.891	4.054	4676.836	27.441	0.000
	Lower-bound	18960.891	1.000	18960.891	27.441	0.000
Error (factor1)	Sphericity assumed	69097.442	500	138.195		
	Greenhouse-Geisser	69097.442	387.820	178.169		
	Huynh-Feldt	69097.442	405.421	170.434		
	Lower-bound	69097.442	100.000	690.974		

Measure: MEASURE_1.

RESEARCH METHODS AND MATERIALS

Exciting and inspiring though they may be, discovering whether these exercises contributed to improving students' creativity is crucial. It was not possible to observe each student in subsequent design studios or in later professional practice. What could be done was to measure the progress of students within the duration of the course. Therefore we decided to study the students' grade archives for the conceptual exercises to see whether the grades indicated progress or not. The first exercises are usually graded gently in order not to discourage the students, so we eliminated them. From the remaining exercises, we chose the first six purely conceptual ones and ran the one-way ANOVA test for repeated measures. Descriptive statistics are given in Table 1. In order to understand which group of variables cause the major difference (in other words, to ascertain the critical moment of the student's progress) we have also run a pairwise comparison test (Table 3). The "Bonferroni's post-hoc analysis" between groups 1-4,1-5,1-6, 2-4,2-5,2-6,3-4,3-5, and 3-6, with a significance value higher than 0,01 ($p = 0,00$, $p< 0,01$), clearly points to a difference between the first three and the last three exercises. Since mentors worked as a team and each graded the exercise she or he conducted we were concerned with the relative assessments mentors made in marking the works; although each mentor ranked students fairly some mentors looked at works very positively and some did not. Therefore we decided to choose those exercises graded by the same mentor from the first three and the last three, in order to ensure consistency. For the year 2009 the 2nd and 7th class exercises and the 2nd and 5th take-homes were chosen as controls for statistical analyses.

First we wished to see whether or not studio works and take-home products done at nearly the same time revealed any difference in terms of quality and creativity. Paired sample tests were run for this purpose (Table 4). As we had expected, there was no significant difference in quality or creativity between the first exercise and the first take-home assignment, which were co-temporal [Pair1 Exercise1-Assign1 sig. (2-tailed) = 0.330, 0.05 < p]. Neither was there a significant difference between the sixth exercise and the fourth assignment, which were also co-temporal [Pair 2 Exercise 6-Assign4; sig (2-tailed) = 0.490, 0.05 < p]. In addition, the correlation coefficient ($r = 0.410$) indicated that grades obtained from the class exercises and take-home assignments were not strongly correlated. Higher grades from the exercises did not necessarily correspond with higher grades from the assignments.

In contrast, there was a significant difference in terms of student performance and creativity between early and late exercises, as well as between early and late assignments, as revealed by ANOVA tests. We also ran paired sample tests for pair 3 [Pair3 Assign1-Assign4: sig (2-tailed) =0.000, $p < 0.05$] and for pair 4 [Pair 4 Exercise1 – Exercise 7: sig (2-tailed) =0.000, $p < 0.05$]. The results corroborated the above finding (Table 4). However, the low correlation ($r = 0.121$) means that higher grades from the early exercises did not necessarily correspond to higher grades from the late exercises. The same was true for the assignments. These findings could mean several things: 1) spending longer time on the work does not necessarily lead to better student creativity; some benefitted more, and some benefitted less, 2) students' individual, unguided research plays a circumstantial role in their success, and/or 3) some students might even be getting help from more experienced colleagues. Nevertheless, the arithmetic mean of the second exercise was 54.41%, while that of the ninth exercise was 67.67%. Between the second and ninth exercises, 75 out of 101 students raised their grades, 20 had a lowered grade and 6 students received the same grades. For the process of concept-image transformation a standard rise in grades over time was not expected.

As noted above, success in design is contingent on a multiplicity of factors in arts and architecture. Some problems may be more difficult than others; some mentors may be more generous than others. Nevertheless, it is an important finding that three-quarters of students showed progress in their creative abilities within approximately two months of instruction.

Table 3. Pairwise comparisons.

(I) factor 1	(J) factor 1	Mean difference (I-J)	Std. error	Sig.(a)	95% Confidence interval for difference(a)	
					Lower bound	Upper bound
1	2	-0.743	1.159	1.000	-4.228	2.743
	3	-1.386	1.661	1.000	-6.381	3.608
	4	-10.891(*)	1.721	0.000	-16.067	-5.715
	5	-11.139(*)	1.740	0.000	-16.373	-5.905
	6	-13.267(*)	1.455	0.000	-17.642	-8.893
2	1	0.743	1.159	1.000	-2.743	4.228
	3	-0.644	1.218	1.000	-4.306	3.019
	4	-10.149(*)	1.602	0.000	-14.966	-5.331
	5	-10.396(*)	1.334	0.000	-14.409	-6.383
	6	-12.525(*)	1.329	0.000	-16.521	-8.529
3	1	1.386	1.661	1.000	-3.608	6.381
	2	0.644	1.218	1.000	-3.019	4.306
	4	-9.505(*)	2.090	0.000	-15.791	-3.219
	5	-9.752(*)	1.633	0.000	-14.662	-4.843
	6	-11.881(*)	1.767	0.000	-17.196	-6.567
4	1	10.891(*)	1.721	0.000	5.715	16.067
	2	10.149(*)	1.602	0.000	5.331	14.966
	3	9.505(*)	2.090	0.000	3.219	15.791
	5	-0.248	2.158	1.000	-6.736	6.241
	6	-2.376	1.797	1.000	-7.782	3.029
5	1	11.139(*)	1.740	0.000	5.905	16.373
	2	10.396(*)	1.334	0.000	6.383	14.409
	3	9.752(*)	1.633	0.000	4.843	14.662
	4	0.248	2.158	1.000	-6.241	6.736
	6	-2.129	1.789	1.000	-7.508	3.251
6	1	13.267(*)	1.455	0.000	8.893	17.642
	2	12.525(*)	1.329	0.000	8.529	16.521
	3	11.881(*)	1.767	0.000	6.567	17.196
	4	2.376	1.797	1.000	-3.029	7.782
	5	2.129	1.789	1.000	-3.251	7.508

Measure: MEASURE_1.
Based on estimated marginal means
* The mean difference is significant at the 0.05 level.
(a) Adjustment for multiple comparisons: Bonferroni.

Table 4. Paired samples test.

		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
					Lower	Upper			
Pair 1	Exercise1 - Assign1	-1.634	16.780	1.670	-4.946	1.679	-0.978	100	0.330
Pair 2	Exercise7 - Assign4	-1.287	18.650	1.856	-4.969	2.395	-0.694	100	0.490
Pair 3	Assign1 - Assign4	-10.842	16.402	1.632	-14.080	-7.604	-6.643	100	0.000
Pair 4	Exercise1 - Exercise7	-11.188	16.018	1.594	-14.350	-8.026	-7.020	100	0.000

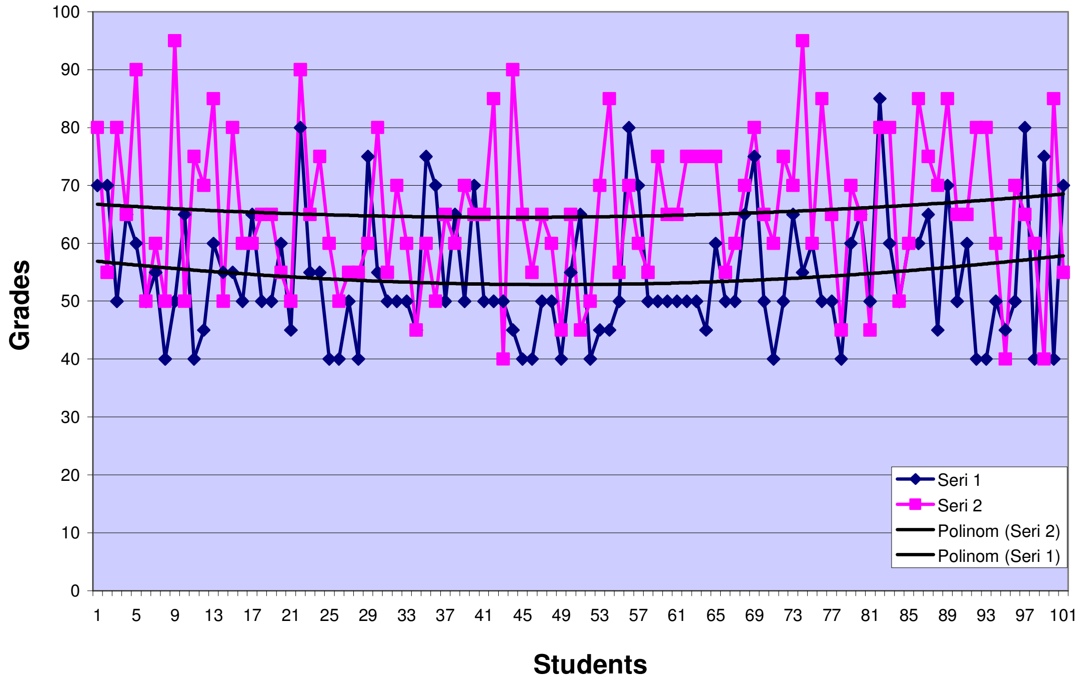

Figure 13. Graph showing the polinoms of student grades obtained from the 2nd and the 9th studio exercises.

RESULTS

The results (Table 2) show that that the mean values of the variables (grades) are significantly different statistically ($p = 0.00$; $p < 0.01$).

DISCUSSIONS

Our statistical findings indicate certain realities. First, whether students embarked on a problem in the studio within a given time or worked on the problem away from class at their own convenience did not result in much difference in their perception of the problem, and appeared to have no influence on whether they produced a successful interpretation. Therefore those philosophers who profess that creativity is a fast solution to problems are corroborated. The amount of time spent in solving a problem seemed quite irrelevant: problems can be solved quickly if creativity is involved. However, being trained in the approach of "seeing problems as" showed a payoff even over the short period of two months. The grades achieved by students as the course progressed were significantly higher than the grades students got at the beginning of the course. Some may question the research approach and whether the progress shown by students actually implies creativity. This criticism might be valid if a thorough architectural design problem had been incorporated in the research; in that case, a particular stage might not accurately reflect the entire project, but here every exercise engages an individual problem and each solution is a complete solution in itself. Others might argue that what is actually improving is a student's ability to think as a designer and that this does not necessarily indicate creativity. Indeed creativity is a mode of thinking. Creative results are achieved by way of creative thinking. If a student's usual mode of thinking is being transformed into creative thinking this is certainly is what is desired. Students are bestowed with different levels of talent and start with different grades. The students improve, but each does so within his or her own capacity. The polinoms of the first grades and the last are almost parallel in the case of class exercises and take-home assignments (Figures 13 and 14). This clearly demonstrates that students who start with moderate grades do not make shocking advances; neither do the somewhat talented ones. They develop equally well, but moderately. However, the difference between them is likely to persist.

In architectural education, there are various methods of teaching basic design courses. At opposite ends of the spectrum are the experimental and the conceptual approaches. This study has focused on the conceptual approach in basic architectural design courses and successfully demonstrated that students benefit from it. With the conceptual approach, students (irrespective of their inborn talent levels) learn creative modes of thinking that are highly important in practicing architecture. The success of the experimental approach to teaching basic design has never been investigated; thus we cannot declare whether the conceptual approach is superior. Our results must be checked and compared by those who

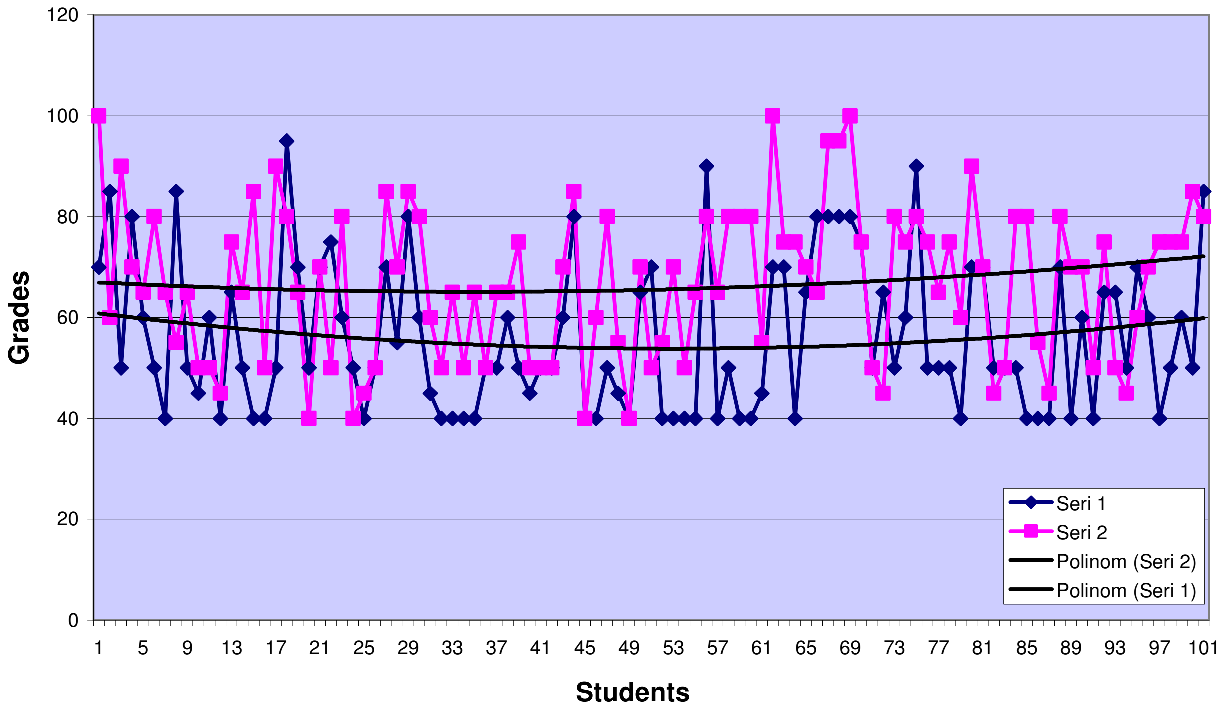

Figure 14. Graph showing the polinoms of student grades obtained from the 2nd and 5th take-home assignments.

follow the experimental approach; only then can a comparison of methods be made. By conducting this research we hereby set an example for them. Nevertheless, basic design courses as they are administered at our school and at many other schools make valuable contributions to the training of architecture students. The loose-knit framework enables developments in teaching philosophy that are parallel to changes in the philosophy of architecture. Basic design courses should be reviewed and revised frequently and efficiently, but they should continue to be an integral part of architectural curricula all over the world.

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