

Can creativity be taught? An empirical study on benefits of visual analogy in basic design education

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Abstract:

The impact of analogical reasoning in general, and visual analogy in particular, upon generation of creative concepts appears to be long debated; where one group talks about affirmative effects of visual analogy over creativity, whereas other groups regard that it limits creativity. This study aims to test whether the use of visual images does foster creativity in the first year of design education. 52 first year students studying in City and Regional Planning Department, a design based program, participated in the study. Participants were asked to design eight compositions to convey the expression of eight design concepts including; harmony, contrast, emphasis, cluster, unity, variety, radial balance, and asymmetrical balance. The students were asked to think about the concept and design a 30x30 cm composition to give the impression of each concept by using three basic geometric forms; square, triangle and circle. All participants were tested as a group. For half of the basic design principles (harmony, contrast, unity and variety) no visual clues were given, for the other half (emphasis and cluster, and radial balance and asymmetrical balance) visual clues were given. The visual clues included well known paintings as artwork examples and two dimensional design compositions as task related examples produced in earlier basic design courses. Findings showed affirmative effects of visual analogy on creativity. Students achieved higher creativity score when visual clues were present than when they are absent. Results have implications in basic design education. The novice design students may be encouraged to study former visual examples rather than starting from scratch. Former visual examples could be used as sources of inspiration to solve ill-structured design problems.

Keywords: *visual analogy, creativity, basic design education, empirical research*

Introduction

Creativity is a necessity for all spheres of life. From the day it was merely related with the field of arts to the day it gained a broader meaning in the sense of creating new and innovative solutions to problems of any kind, creativity is no longer conceived as including only the spectrum of arts, but also all sciences and even daily life. The emergence of new concepts like the creative city or creative industries (Landry, 2000) is no surprise to that extent. Accepting that the design process is a problem-solving process that

involves creating innovative solutions, it has become inevitable for the designer (namely, the architect or the planner) to approach the problem systematically. By the same token, innovative thinking is no longer confined to the domain of artists, but also involves urban contexts to be reconsidered in a systematic manner.

Banaji and Burn (2007) argued that there is a wide range of descriptions and definitions discussing the overall extent of the creativity which is constructed as a series of rhetorical claims, where ten rhetorics are described in relation to the philosophical or political traditions from which they spring. Asking whether creativity is more usefully understood as an internal cognitive function or an external cultural phenomenon, Banaji and Burn (2007) make the following statement concerning the wide range of existing definitions:

“Creativity itself has been subject to a range of competing definitions in recent years. Such definitions are, however, insufficiently precise to avoid familiar binary oppositions and contradictions in this area which construct creativity as, respectively, elite or democratic; originating from nothing or generic and transformative; spontaneous or taught and learned; universal or culture specific; imaginative and intuitive or knowledge and skills-based; ineffable and instinctive or quantifiable and testable.”(Banaji & Burn, 2007, p.68).

The answers to these considerations are claimed to be inherent in the rhetorics Banaji and Burn (2007) have identified. Nevertheless, the stated oppositions and contradictions ‘to be avoided’ do propose an approach that outlines what characteristics the notion of creativity is to adopt.

In this article, the intention is to regard creativity as mainly a process that can be taught. However, the extent to which creativity is enhanced by means of education remains to be further dwelled upon. The field of design, no matter what the designed product is, appears to be one of the most complicated fields that depend on occurrence of some sense of creation that is believed to have connections with ‘aptitude’. But yet, despite the interpretation where ‘aptitude’ avails for ‘imagination’ that is misused as synonymous to creativity, “one should realize that imagination’s relation to creativity exists because it is *a-priori* to it” (Denel, 1981). This shall be the main idea underlying design education that aims at fostering creativity. However, the matter as to how this can be implemented in the first year design courses still needs further thought and experimenting.

Departing from this point, this article is based upon the two inter-related premises stating that:

- Creativity can be taught.
- Visual analogy is assumed to be highly beneficial in evoking imaginative thinking.

The question of what kind of impacts visual analogy may have upon creativity constitutes the main framework of this study, which is assumed to have considerable implications for teaching creativity in design in particular.

Visual analogy and creativity

Nearly all children are born with creative ability; however, this ability may be lost, if not enhanced, through the years (Denel, 1981). Studies showed that creative ability is influenced by many factors including: biology, personality,

motivation (see reviews by Malaga, 2000) and training (VanGundy, 1982). Assuming that creativity is a skill that can be learned and taught, the question of how creativity can be enhanced or how one can be taught to be creative in design problem-solving has been a challenge of design education (Casakin & Goldschmidt, 1999; Casakin, 2007; Cross, 1997; Hasirci & Demirkan, 2007).

Although, the instructors in the field of design aims to educate students to be 'scientifically oriented', 'scholarly minded', 'artistically endowed' and '*creatively active*' (Denel, 1981), the process that will lead to this goal is unclear. In the first year of design education, as the basis of architectural and planning education, the students enter a visual world to bring creative solutions to design problems which are generally characterized by an ill-defined structure. For an ill-defined problem, the goal may be undefined and the path to solution may be multiple. The problem can lead to several different, equally correct solutions. Those alternative solutions might be too many and optimal solution might not be single (Casakin & Goldschmidt, 1999; Casakin & Goldschmidt, 2000). Thus finding a creative solution for an ill-defined problem is a trouble for most of the novice design students, if not all. In the absence of clearly and precisely defined teaching and learning tools, a novice design student is expected to develop skills to solve such design problems through 'learning by doing' or 'trial and error' (Casakin & Goldschmidt, 1999). However, such experiential teaching traditions may fall short to effectively transfer the instructors' knowledge and experience, about how to design and how to reason about designing, to students who aim to gain knowledge to solve ill-defined problems (Goldschmidt, 2001). Given that, we highlight the necessity to develop teaching tools and suggest that analogical reasoning might be used as a powerful teaching tool in the first year of design education.

Analogical reasoning refers to the transfer of relational information from a known situation, which is called as 'source', to an unknown situation, which is called as 'target' (Casakin & Goldschmidt, 1999; Halin, Bignon, Scaletsky, Nakapan, & Kacher, 2003). It helps to explain new problems in terms of familiar ones (Casakin & Goldschmidt, 2000). Thus it may be a powerful problem-solving strategy (Casakin & Goldschmidt, 1999) for ill-defined problems. The use of analogical reasoning on creativity has been examined in different domains; such as manufacture (Eckert, Clarkson & Zanker, 2004; Eckert, Stacey & Earl, 2005; Eckert & Stacey, 2000), management (MacCrimmon & Wagner, 1991; 1994), chemistry and advertisement (see discussions of Kekule's insight and the Dommelsch Advertisement Campaign in Goldschmidt, 2001), media education (Banaji & Burn, 2007), landscape design (Büscher, Gill, Mogensen, & Shapiro, 2001), industrial design (Ertoptamis, 2006) and architectural design (Goldschmidt 1995, 1998; Halin et. al., 2003; Oxman, 1997). In fact in some domains a computer tool has been developed to catalogue the reference designs for communication of ideas or to trigger new ideas (Büscher et. al., 2001 Ertoptamis, 2006; Halin et. al., 2003; MacCrimmon & Wagner, 1991; 1994). Although the use of analogical reasoning has been investigated in many domains, empirical studies on its use in design education and teaching of creativity is limited (Casakin & Goldschmidt 1999; Goldschmidt & Smolkov, 2006). Furthermore these studies conducted empirical tests on experienced design students. No study has hitherto tested the effect of analogical reasoning on novice students who are in their first year of design education.

Considering the fact that a new design would evolve from the modification of an existing solution when analogy is used (Oxman, 1997), the influence of analogy on creativity can be positive or negative (Casakin & Goldschmidt, 1999; 2000; Eckert et. al., 2005; Gick & Holyoak, 1980; Goldschmidt, 2001; Goldschmidt & Smolkov, 2004; 2006; Malaga, 2000). Affirmative effects of analogy over creativity would be observed when one uses analogy to understand the problem or to draw ideas from past designs. Negative effects of analogy over creativity would be observed when the use of analogy is based on an unsuccessful or inappropriate design solution or when it limits designers' imagination to specific solutions and lead them to filter out potential creative solutions. This is called fixation effect of analogy (Eckert et. al., 2005; Schwert, 2007). As scientific and anecdotal evidence show an unclear picture about the influence of analogy on creativity, we believe that the question whether, and how, creativity in design education can be enhanced by means of analogy needs to be explored empirically.

Analogical reasoning can occur with picture clues, word or sentence clues, and combination of picture and word clues (Malaga, 2000; Schwert, 2007). As for design based professions, Goldschmidt and Smolkov (2006) argued that sources of inspiration that serve designers are not only verbal but also visual. Designers, in all disciplines including architecture and planning, are supposed to think visually, and they deal with visual features more than others (Bilda and Gero, 2004). Thus, for design instructors, the impact of picture clues on promoting visual thinking ability emerges as a more important question than the impact of verbal clues on promoting visual thinking ability. Yet, no one has tested whether visual clues leads to more creative solutions for design problems. Visual clues would have surface similarity to design problems thus they may help a novice student to understand the problem correctly, but they may also cause fixation in the solution of the design problems.

Fodor (1975) once argued that adults think in words, whereas children think in pictures (as cited in Goldschmidt, 2001). If this is the reason why children have more creative potential than adults, then we may expect adults' creativity to be promoted when visual thinking ability, that are lost due to having been underused or unused since childhood, is re-gained. Visual clues may aid in learning idea development because they give an idea of how abstract knowledge or concepts turn into concrete outcomes or real practice. Thus we hypothesize that visual clues would promote visual thinking ability and better design solutions would be attained to design problems via use of visual clues.

Method

General Methodological Approach

Students were asked to solve eight ill-defined problems, design compositions to convey the expression of eight design concepts, in four studio days. Each day the students were asked to design two 30x30 cm compositions to give the impression of two design concepts by using three basic forms; square, triangle and circle. For half of the concepts students were provided some visual clues and for the other half the students did not receive any visual clues. Design experts rated each design composition on a seven point scale for their originality and creativity.

Participants

52 students between the ages of 18 and 21 took part in the study. The study group was about balanced as to gender (48% female and 52% male). All

students were from the Department of City and Regional Planning of School of Architecture at Dokuz Eylul University, Izmir, Turkey. Students received course credit for their participation.

Tasks – Design Compositions

The design concept pairs included: (1) harmony and contrast, (2) emphasis and cluster, (3) unity and variety, and (4) radial balance and asymmetrical balance. Determination of the concepts was based on the idea that these concept pairs shall not necessarily be antonyms of each other. In spatial design frameworks, the tasks based on emphasis and cluster formation, for instance, are not opposite, but yet different in their essence. Whereas emphasis creates a focal point in spatial design, clustering embodies no intention for creation of any single focal point while bringing a multiple set of spatial elements together. The idea is that ways of teaching one concept ('emphasis') inevitably entails consideration of another ('clustering'). Thus, the task of thinking about concept pairs involves bringing out the distinctiveness of each concept in relation to the other. No matter antonyms or not, it may be suggested for many cases, that the adopted goal (particularly in different practices of design) is to achieve a synthesis of different concepts. The goal of reaching 'unity "in" variety' constitutes an example as such.

The Procedure

The instructions for each task were explained to participants in 10 minutes, by the same instructor. Verbal definitions about the concepts were not given, because this study focuses on the impact of visual clues rather than verbal clues. The students were asked to think about the design concept and design a 30x30 cm composition to give the impression of each concept by using three basic forms; square, triangle and circle. The three basic forms were chosen on purpose as based on Gestalt psychology, which involves mind's simplification of environment during the act of perceiving. In terms of geometrical forms, the square, circle and triangle are the most definite among all. Students were told that they can convey the expression asked, such as harmony, contrast etc., by manipulating the (1) the number of forms, (2) the sizes of forms, (3) the position of forms, and (3) the location of forms in a design composition. The compositions were told to be designed as black and white compositions as the concept of color had not been explained, discussed and exercised based on the course curriculum when the exercise was given. It must be recalled that students were asked to design a composition, which gives the expression of two design concepts simultaneously (such as harmony and contrast), thus they were asked to use a 50x70 cm. paper and use half of the paper for one concept (such as harmony) and the other half for the other concept (such as contrast).

All participants were lectured and tested as a group. While explaining the problems, the instructor did not show any visual displays for half of the concepts (harmony - contrast, and unity - variety) and showed some visual images for the other half (emphasis - cluster, and radial balance - asymmetrical balance). The instructors chose the visual displays to display to the students from their previous lecture notes randomly. For each concept, half of the visual displays were chosen from the same domain, such as good examples produced by previous students to the same problem, and the other half were chosen from remote domains, such as art works. The visual stimuli were chosen from two different domains because, previous literature on visual analogy suggests using sources that are closely

related to the target problem and sources that are distantly related to the target problem (Malaga, 2000; Schwert, 2007; Casakin & Goldschmidt 1999; 2000). Examples of these visual displays are demonstrated in Figures 1, 2, 3 and 4.

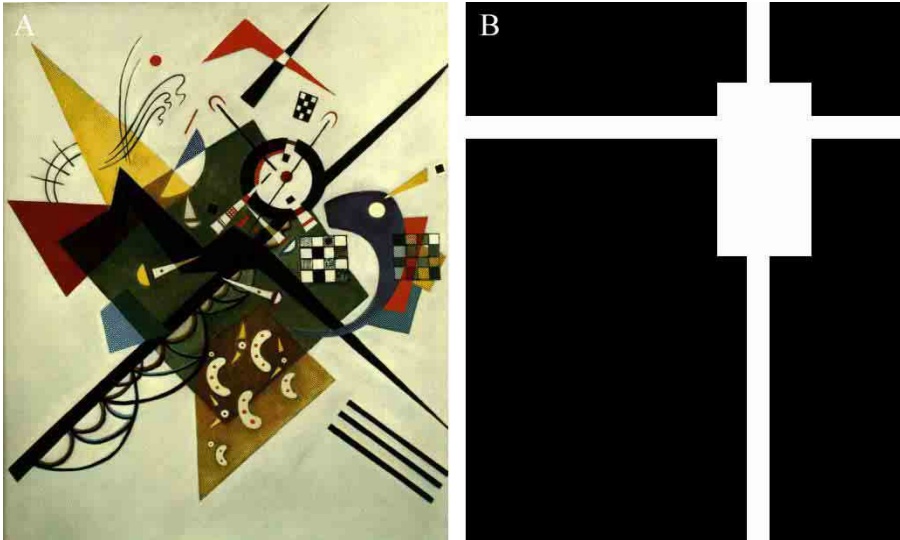


Figure 1. The picture on the left (A) shows an example of art work (a painting by Wassily Kandinsky) and the picture on the right (B) shows a good example produced by a previous student to convey the expression of emphasis .

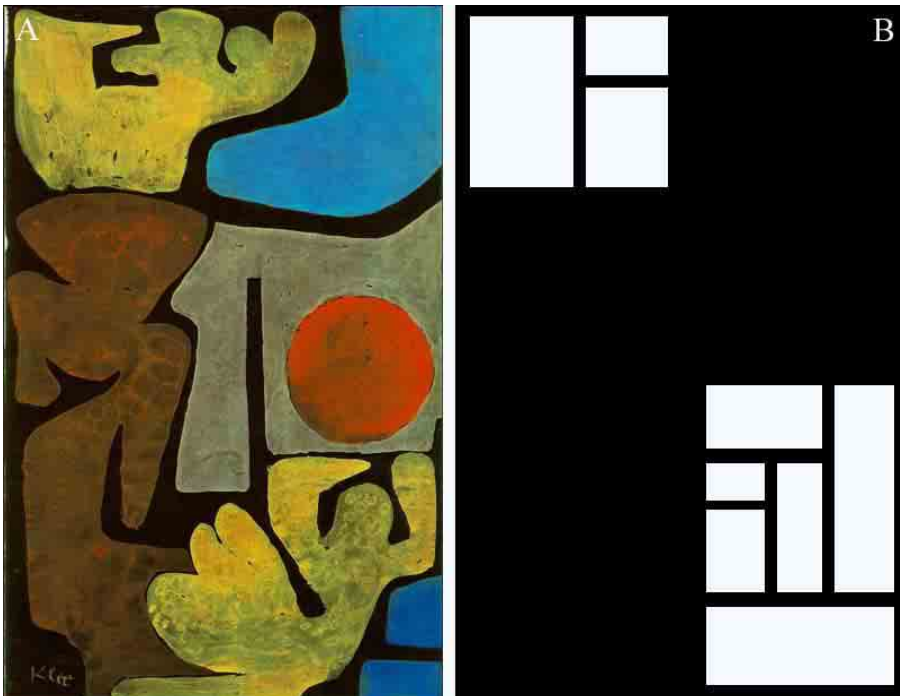


Figure 2. The picture on the left (A) shows an example of art work (a painting by Paul Klee) and the picture on the right (B) shows a good example produced by a previous student to convey the expression of cluster .

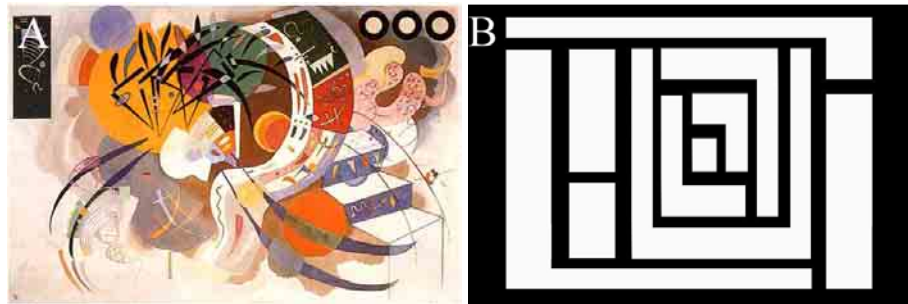


Figure 3. The picture on the left (A) shows an example of art work (a painting by Wassily Kandinsky) and the picture on the right (B) shows a good example produced by a previous student to convey the expression of radial balance .

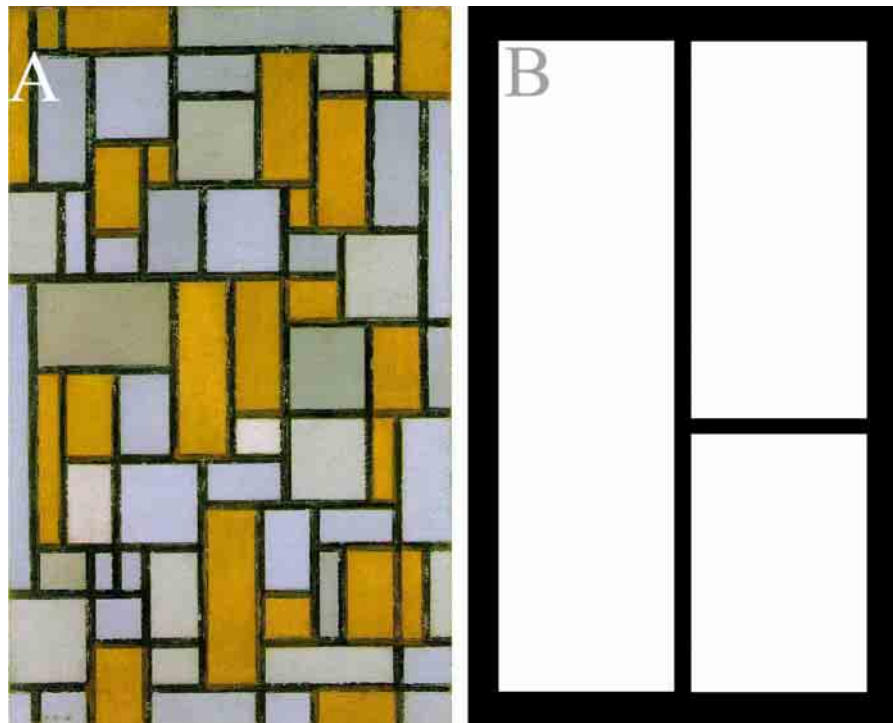


Figure 4. The picture on the left (A) shows an example of art work (a painting by Piet Mondrian) and the picture on the right (B) shows a good example produced by a previous student to convey the expression of symmetrical balance .

When visual displays were present, the students were told to use them as clues to solve the given problem, because the literature suggests that people benefit from analogical reasoning better when they are explicitly told to use analogy (Gick & Holyoak, 1980; Schwert, 2007). Although students were told to use analogy with the given visual displays, they were not told how they could do so.

For each problem 4 hours were allocated to develop ideas and to present it on a paper. Each task was completed at first day of a week, between 1pm to 5 pm. The whole experiment took four weeks to complete, between November 20 and December 8, 2006.

Finally, when all exercises were completed, four experts, people graduated from a design based program, scored each design solution of each participant for originality and creativity on a scale of 1-7, where 1 is low and 7 is high.

The Methodological Limitations

The methodological limitations of this study should be addressed to make use of conclusions with caution and to bring forth some interesting future research areas. There were six limitations related to the experimental set up and the characteristics of the subject group. First, the participants were asked to solve some simple design problems. However, results obtained from those specific simple design problems may not apply to other design tasks. Future studies may compare the effect of the use visual stimuli on solving simple and complex design tasks. Second, visual images selected as examples to define the concept in question were not selected systematically. Some visuals were selected from the same domain and others were selected from remote domains in regard to the problem. The effect of each type of visual stimuli was not compared. A useful extension of this study may compare the creativity of design solutions when visual stimuli are selected from the same domain as the problem and from other domains. Third, this study, like many before, use limited number of visual displays. The number of visual displays may effect creativity differently. For example, limited number of visual examples may foster creativity, but voluminous number of visual examples may limit creativity, or visa versa. Subsequent work may test the influence of the number of visual displays on creativity of design solutions. Fourth, in this study participants were informed to use analogy when visual displays were present. Future studies may compare the influence of informed and uninformed clues. Fifth, this study tested the impact of visual analogy on creativity. Further studies may compare the effect of visual and verbal clues on creativity of design-problem solutions. Sixth, all the participants in this study were first year students studying in city and regional planning department, in one university. Whether the results of the present study will apply to different design programs, such as industrial design or architecture, remains to be seen. More work needs to be done to test the generalization of the results to various levels of design education, such as second, third and fourth year of design education.

Statistical analysis

First, as creativity was measured subjectively by four experts, the agreement between judges was analyzed for each task. The Cronbach Alpha tests of inter-observer reliability for different combinations of four judges were analyzed. There was a moderate agreement on each task (harmony, 0.68; contrast, 0.65; emphasis, 0.84; cluster, 0.86; unity, 0.72; variety, 0.55; radial balance, 0.73; and asymmetrical balance, 0.58). For some tasks, Cronbach Alpha was high for two judges, for others it was high for three judges. The scores from judges, whose scores showed the highest agreement based on Cronbach Alpha test, were averaged for each task for each student to have a more objective measure of creativity score.

Table 1 shows the mean creativity scores, ordered from lowest to highest, for separate tasks. Students achieved higher creativity score when visual clues were present. Students received higher creativity score only for one without visual clue (unity) task than two with visual clues (emphasis and cluster) tasks. However, the difference was not significant.

Table 1. The mean creativity scores for separate tasks.

	Visual Clues	Number of Participants	Mean	Std. Deviation
Contrast	Absent	50	2.5	1.6
Variety	Absent	47	3.3	1.3
Harmony	Absent	50	3.5	1.6
Emphasis	Present	47	3.6	1.8
Cluster	Present	43	3.9	1.9
Unity	Absent	47	4.0	1.2
Asymmetrical balance	Present	48	4.7	1.4
Radial balance	Present	48	5.1	1.3

Table 2 shows the mean creativity scores, from lowest to highest, for paired tasks. Higher creativity scores were observed when visual clues were present.

Table 2. The mean creativity scores for task pairs.

	Visual Clues	Number of Participants	Mean	Std. Deviation
Harmony and Contrast	Without	50	3.0	1.3
Unity and Variety	Without	47	3.6	1.0
Emphasis and Cluster	With	48	3.8	1.3
Radial and Asymmetrical Balance	With	48	4.9	1.0

Finally, for each student one average creativity score was calculated for 'WITH' visual clues tasks, and another average creativity score was calculated for tasks that were explained 'WITHOUT' visual clues tasks. Then the mean scores for two groups were compared with paired sample t-test. The results showed a significant difference between 'WITH' visual clues tasks and 'WITHOUT' visual clues tasks ($t = 5.51$, $df = 41$, $p < 0.01$). When visual clues were given creativity score was higher ($n = 42$, $mean = 4.3$, $sd = 0.9$) than when visual clues were not given ($n = 42$, $mean = 3.4$, $sd = 1.0$).

Conclusion

Teaching creativity appears to be a critical task in design education. The design educators consider the affirmative and negative aspects of visual analogy upon creativity as it has become a very important issue not just for design, but for other domains as well. In this article, the adopted empirical study provides evidence that novice design students benefit from analogical reasoning based on visual clues, and show better creativity performance when a first year design studio exercise is given with visual clues than without them. This finding is particularly important for design educators who got stuck in between the dilemma on the impact of visual examples upon generation of creative skills.

The results of this study have practical implications for design education. For example, instructors teaching design often encounter questions from novice and expert students about how to start designing. The answer should be: 'Start exploring the visual world! The related, and perhaps the unrelated visual examples that are produced, no matter in what domain; arts, architecture or manufacture, could be used as sources of inspiration'. Even

one of the greatest painters of all times, Van Gogh was inspired from others such as Eisen, Millet, Rembrandt etc. For example, Van Gogh Museum in Amsterdam demonstrated how he used Japanese artist Kesai Eisen's work, which had been used for the cover of Paris Illustré, in one of his paintings (Figure 5). Likewise Casakin and Goldschmidt (1999) provide two anecdotal examples where Le Corbusier, the architect-planner of modern times, and Calatrava, the famous artist, used successful analogies from nature as their sources in act of creation.

In parallel with such anecdotal evidence, the results of this study indicated that a novice student would be able to produce more creative products for ill-defined design problems by studying former visual examples. Providing such visual examples did not cause fixation for simple design tasks, such as designing a composition to convey the expression of symmetrical balance or harmony.



Figure5. The picture on the left (A) shows the painting by Kesai Eisen and the picture on the right (B) shows the painting by Van Gogh.

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Yaratıcılık öğretilir mi? Temel tasarım eğitiminde görsel analogiden faydalanma üzerine ampirik bir araştırma

Genel anlamda analogik düşünme biçiminin, özel olarak ise görsel analogilerin yaratıcı düşüncenin oluşumu üzerindeki etkisi uzmanlarca uzun zamandır tartışılan bir konudur (Malaga,2000; Schwert,2007). Yaratıcılığın doğuştan gelen bir yetenek ya da öğretilir bir beceri olup olmadığı tartışılırken, tasarım eğitiminde yaratıcı süreçlerin nasıl desteklenebileceği de araştırılmaktadır (Casakin & Goldschmidt, 1999; Casakin, 2007; Cross, 1997; Hasirci & Demirkan, 2007). Görsel analogiyi temel alan bazı araştırmalar bu anlamda önem kazanmaktadır, çünkü tasarım süreçleri içerisinde kimileri görsel analogi kullanımının yararlarından söz ederken, kimileri görsel analogi kullanımının yaratıcılığın sınırlandırıldığı yönünde görüş bildirmektedirler (Casakin & Goldschmidt, 1999; 2000; Eckert et. al., 2005; Gick & Holyoak, 1980; Goldschmidt, 2001; Goldschmidt & Smolkov, 2004; 2006; Malaga, 2000).

Özellikle tasarım eğitiminin ilk yılında tasarım problemlerinin net olarak tariflenmeyen yapısı içerisinde deneyimsiz öğrencilerin 'deneme-yanılma' ya da 'yaparak öğrenme' sürecine girdikleri gözlemlenmektedir. Ancak bu yönde gelişen bir süreç, öğrencilerin tasarım eğitimlerinin bilgi ve deneyimlerinden yeterince faydalanamamalarına neden olmaktadır. Bu durum temel tasarım eğitiminde alternatif öğretim araçlarının geliştirilmesini gerekli kılmaktadır. Analogik düşünme yeteneğini geliştirebilecek öğretim araçları özellikle tasarım eğitiminin başlangıç yılında yaratıcılığı artırmanın asal bir aracı olabilirler. Görsel analogi kullanımı üzerinde birçok farklı alanda araştırmalar yapılmış olmakla beraber (Eckert, Clarkson & Zanker, 2004; Eckert, Stacey & Earl, 2005; Eckert & Stacey, 2000; MacCrimmon & Wagner, 1991; 1994; Banaji & Burn, 2007; Büscher, Gill, Mogensen, & Shapiro, 2001; Ertoptamis, 2006; Goldschmidt 1995, 1998; Halin et. al., 2003; Oxman, 1997), bu araçtan tasarım eğitimi ve yaratıcılığın öğretimi açısından ne şekilde yararlanılabileceği konusunda yapılmış ampirik araştırmalar oldukça kısıtlıdır ve sadece deneyimli öğrencileri temel alan bir çerçevede sınırlı tutulmuştur (Casakin & Goldschmidt 1999; Goldschmidt & Smolkov, 2006). Dolayısıyla, tasarım eğitiminin birinci yılında deneyimsiz ya da acemi olarak nitelendirilebilecek öğrencilerin gelişimi üzerine temellendirilmiş herhangi bir ampirik araştırma bulunmamaktadır. Bu çalışma da tasarım süreçleriyle yeni tanışan öğrenciler üzerinde kurgulanmış bir ampirik araştırmaya temellenmesiyle, yaratıcılığın nasıl geliştirilebileceği / öğretilerebileceği yönündeki bilgi oluşumuna katkıda bulunmayı amaçlamaktadır.

Analogik düşünme biçimi resim ya da metin örnekleri ya da resimlerle metinlerin birarada sunulduğu örnekler üzerinden geliştirilebilir (Malaga, 2000; Schwert, 2007). Tasarım eğitimi özelinde, görsel düşünme yeteneğinin sözel düşünme yeteneğinden daha önemli olduğu varsayımından hareketle, bu çalışma görsel analogi kullanımının tasarım süreci üzerindeki etkisine temellenmekte ve görsel analogilerin yaratıcılığa etkisinin olumlu mu olumsuz mu olduğu sorgulamaktadır. Tüm tasarım alanlarında,

özellikle de mimarlık ve planlama alanlarında, görsel düşünme yetisinin nasıl artırılabilirliği konusu bilhassa tasarım eğitmenlerinin karşı karşıya kaldığı önemli bir husustur. Ancak tasarım alanında görsel düşünme yeteneğini artıracak araçlar konusu ampirik araştırmalara neredeyse hiç konu olmamaktadır denebilir. Bu nedenle yürütülen bu araştırma, tasarım süreci ile ilk kez tanışan öğrencilere görsel analogi kurma imkânı vererek yaratıcılığın “öğretilebilirliği” konusunun sorgulanmaktadır.

Tasarım programında eğitim gören öğrencilere gösterilen görsel imajların onların yaratıcı düşünme biçimleri üzerindeki etkisini test etmeyi amaçlayan bu araştırmaya Dokuz Eylül Üniversitesi, Şehir ve Bölge Planlama Bölümünde temel tasarım eğitimine devam etmekte olan 52 öğrenci katılmıştır. Katılımcılardan dört kavram çifti üzerine kompozisyonlar tasarlamaları istenmiştir. Bu kavramlar: (1) uyum - kontrast, (2) odaklanma – kümelenme, (3) tekdüzelik - çeşitlilik, (4) simetrik denge - radyal denge olarak belirlenmiş düzen öğeleridir. Kavram çiftlerinin seçiminde iki kavramın birbirine zıt olması şart koşulmamıştır, ancak bu kavram çiftlerinde bir kavramın diğeri üzerinden tarif edilebilir olmasına dikkat edilmiştir. Her kavram çifti için tasarlanacak kompozisyonlarda dikkat edilecek noktalar, aynı eğitmen tarafından, katılımcıların tümüne birarada olmak kaydıyla, 10 dakikalık bir ders olarak açıklanmıştır. Kavramlar için sözel bir açıklama verilmemiştir. Katılımcılardan bu kavramlar üzerine düşünceleri ve 30 X 30 cm boyutunda bir kompozisyonla bu kavramları ifade etmeleri beklendiği açıklanmıştır. Katılımcılar, bu kompozisyonlarda üç temel geometrik formdan (daire, üçgen, kare) en az birini kullanmak zorunda oldukları ve bu formların kompozisyon içindeki (1) sayılarını, (2) büyüklüklerini, (3) birbirlerine göre açılarını ve (4) konumlarını değiştirerek sorgulanan kavramı ifade edecek özgün bir tasarım elde edebilecekleri konusunda bilgilendirilmişlerdir.

Kavramların yarısının (uyum, kontrast, tekdüzelik, çeşitlilik) açıklanmasında görsel imajlar kullanılmazken, diğer yarısının (odaklanma, kümelenme, simetrik denge, radyal denge) açıklanması görsel imaj destekli olarak kurgulanmıştır. Kullanılan imajların temel tasarım kompozisyonları olduğu kadar sanatsal eser örneklerini de içermesi istenmiştir. Görsel olarak uyarıcı etki yaratması beklenen imajların kasıtlı olarak konu ile doğrudan ve dolaylı ilişki içerisinde olması istendiğinden, imaj seçimi ona göre farklı ilişki düzeylerinde gerçekleştirilmiştir. Öğrencilere analogik düşünme biçimini kullanabilecekleri belirtilmiş, ancak bunun nasıl yapılabileceği kendi yetilerine bırakılmıştır. Elde edilen tasarım örnekleri dört tasarım eğitmeni tarafından özgünlük ve yaratıcılık temelinde değerlendirilmiştir.

Elde edilen sonuçlar görsel imaj göstermenin deneyimsiz ya da acemi olarak nitelendirilebilecek öğrencinin yaratıcılığını arttıran bir etki gösterdiğine işaret etmektedir. Görsel analogilerin yaratıcılığı sınırlandırabileceği ve tasarım olasılıklarında bir sabitleme yaratarak yenilikçi düşüncelerin önünde engel oluşturabileceği yönündeki endişeler böylelikle ikinci planda tutulabilecektir. Ayrıca tasarım örneklerinin sadece mimarlık ya da planlama alanından değil, daha kapsamlı sanat eserleri arasından verilmesi, ilham kaynağı oluşturabilecek kapsamların boyutunu artırabilecek, öğrenciyi keşfedecek daha büyük bir dünya olduğu mesajını verebilecektir.

Kuşkusuz çalışmanın yöntemi kaynaklı olarak belirli eksikliklerden de söz edilmelidir. Nitekim, çalışma kapsamında verilmiş tasarım probleminin basit olması, daha karmaşık problemlerin varlığında yaratıcılığın ne yönde etkilenebileceği sorusunu yanıtızsız bırakacaktır. Ayrıca gösterilen imajların hem temel tasarım örneklerini hem de bilinen sanat eseri örneklerini içermesinden dolayı hangi kategorideki imajların yaratıcılığı tetiklediği açık olarak anlaşılamamaktadır. Diğer taraftan imajların sayısının yaratıcılık üzerinde ne tür bir etki yaratabileceği sorgulanmamıştır. Nitekim imaj sayısı arttıkça yaratıcı düşünme sisteminin olumsuz yönde etkilenip etkilenmediği başka bir ampirik araştırma konusunu oluşturabilir. Bu araştırma kapsamında katılımcılara sunulan görsel sunumları analogi kurmada kullanmaları önerilmiştir ancak bunun nasıl sağlanacağı konusunda bilgi verilmemiştir. Görsel sunumlar ile analogi kurulmasının açıkça ifade edilmediği ya da analoginin nasıl kurulacağını açıkça anlatıldığı koşulların da ayrıca araştırılması mümkündür. Son olarak, katılımcı grubun profilindeki herhangi bir değişikliğin sonuçlar üzerinde ne tür

bir etki yaratabileceđi, daha ileri düzeylerde yapılabilecek arařtırmalara konu olabilecek bir kapsama iřaret etmektedir. Ancak bu yntemsel eksikliklerin varlıđında bile, grsel analogi ve temel tasarım eđitiminde yaratıcılık arasındaki iliřkiyi arařtıran bu ampirik alıřma bundan sonra kurgulanacak benzer testler iin arařtırma deseninin oluřturulmasına yn verebilecektir. Ayrıca bu alıřmadan elde edilen bulgular grsel dřnme yeteneđinin geliřtirilmesi amacıyla geleceđin tasarım eđitiminin de ađırlıklı olarak grsel veriler zerinden kurgulanması gerektiđi mesajını vererek tasarım eđitimine katkıda bulunabilecektir.