

Perspectives on gender in design education: A four years comparative study

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Abstract:

Gender indicators have the special function of pointing out gender related comparison over time. An indicator is a pointer. It can be a measurement, a number, a fact, an opinion or a perception that points at a specific condition or situation, and measures changes in that condition or situation. Although there are several gender indicators, research on diversity issues related to divergent thinking is quite important, since it is most critical to advancement in design education. Because, the question of gender differences in divergent thinking is a complex, controversial and contentious topic, little attention was yet devoted to study the assessment of gender effects on divergent thinking through psychometric tools for the benefits of architectural design education. Although researchers have attempted to measure differences between man and woman in order to provide a better understanding of the women's under-representation in creative fields by identifying physical and psychological differences, a number of questions remain unanswered in architectural design area and they required to be tested in a more empirical way. The aim of this four years experimental study is to explore gender perspectives in architectural design education. A total of 599 undergraduates from different level of design education took part in this comparative experimental study. In order to observe the development of the research and to make a comparison, the first results of the first two years study (147 undergraduates from different level of design education) were given in this paper. Because of the difficulties of defining and operationalising the concept of divergent thinking, the most widely researched and analyzed divergent thinking tests which supported by more evidence of validity and reliability than any others were employed. In similar to the findings of the first two years, the results of this four years comparative study that investigates gender differences through divergent thinking measures with the sample of approximately six hundred undergraduates from different level of education indicated that there is not a statistically significant difference among genders. Although this is the first comprehensive study investigating gender issues through divergent thinking measures with psychometric ways in architectural education literature, findings supported some of others in the general education literature. In spite of these theoretical and experimental results, what can be the reasons of the existence few female role models in creative fields of architecture and design related disciplines discussed in the conclusion part of the study.

Keywords: Gender, architectural design, design education, creativity, divergent thinking.

1. Introduction

Students generally have different backgrounds, different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices. They differ from one another in a wide variety of ways. Researchers have attempted to measure differences between man and woman in order to provide a better understanding of the women's under-representation in creative fields by identifying physical and psychological differences. Girls and woman remain substantially under-represented in mathematics, science, and technology in school and in the workplace. Although this problem is recognized, its complexity is widely underestimated and causes are not well understood. Most previous research has looked at single discipline areas and identified the gender dynamics in relation to one dominant disciplinary discourse. There has been considerable debate about science and technology, but the design area is relatively neglected. (Clegg and Mayfield, 1999; Clegg *et al.*, 1999) For this reason, before the discussion on this experimental study based on design education, in the theoretical construction, gender diversity issues related to creative thinking research will be discussed in general manner.

2. Theoretical framework

There are several gender indicators in education. However, research on diversity issues related to creative thinking is quite important, since it is most critical to human advancement in science, art and technology. Creativity is defined as the ability to produce as many novel and appropriate alternative solutions as possible for an "ill-defined problem" in a limited time (Malaga, 2000). It can be described as a multifaceted phenomenon, derived from the interaction of four major elements: person, process, product, and environment. Creativity is beneficial for individuals as well as institutions and societies since it is linked with productivity and adaptability. Some researchers claim that creativity seems to be the most mysterious and critical human trait necessary for the advancement of humanity (Matud *et al.*, 2007). It is an original cognitive ability and problem solving process which enables individuals to use their intelligence in a way that is unique and directed toward coming up with a product.

Creative thinking ability is a necessity for all spheres of life. Its emergence, development, and continuity vary from person to person. (Cubukcu and Eksioğlu, 2009). It can be influenced by many factors, such as biology, personality and motivation. "Creative thinking" also includes extrinsic influences; such as cultural, social and environmental influences. Past studies on creativity have mainly focused on the relation of creativity to different concepts. Examples include the association of creativity to IQ, intrinsic motivation, problem finding ability, openness to experience, academic achievement, and etc. (Wu, *et al.*, 2005). Therefore, "creativity" can be operationalized multidimensional several measures. In spite of existence of various variables, this study will focus on "divergent thinking measures" that can be considered as major component of creativity.

2.1. Gender

Gender is the wide set of characteristics that are seen to distinguish between male and female. A gender difference is a distinction of biological

and / or physiological characteristics typically associated with either males or females of a species in general. Women and men differ not only in physical attributes and reproductive function but also in the way in which they solve cognitive problems. While the social sciences and gender studies approach gender as a social construct, the natural sciences, regard biological and behavioural differences in males and females as influencing the development of gender in humans; both inform debate about how far biological differences influence gender identity formation (Sterling, 1992). On the other hand, in some gender studies, the term "gender" is used to refer to the social and cultural constructions of masculinities and femininities (Garrett, 1992).

According to researches studying hormones and biological dissimilarities, men and women experience the world differently based upon hormones. The bulk of the evidence suggests, however, that the effects of hormones on brain organization occur so early in life that from the start the environment is acting on differently wired brains in girls and boys. Behavioural, neurological and endocrinologic studies have elucidated the processes giving rise to gender differences in the brain. According to some recent studies male and female brains may be differently structured with the two cerebral hemispheres. Such studies indicate that the left half of the brain in most people critical for speech, the right for certain perceptual and spatial functions. It is widely assumed by many researchers studying gender differences that the two hemispheres are more asymmetrically organized for speech and spatial functions in men than in women. However corpus callosum, an area called the splenium, was larger in women than in men. The view that a male brain is functionally more asymmetric than a female brain is long-standing (Kimura 1992). In the brain, "gray matter" is used for information processing, while "white matter" consists of the connections between processing centres. According to researches using brain mapping, that men have more than six times the amount of grey matter than women, and women have nearly ten times the amount of white matter than men (Haier, *et al.*, 2004). Despite these scientific proofs related with biological differences, there still remains no clear relationship between physical brain measurement and functional capacity. A consensus has existed that there are no gender differences in overall general intelligence (Anderson, 2004). Men and women apparently achieve similar IQ results with different brain regions. Findings of "no gender difference in intelligence" have since been replicated many times on different standardization samples with different test batteries.

Thus, it can be indicated that, the major gender differences in intellectual function seem to lie in patterns of ability rather than in overall level of intelligence (IQ). Females are often found to average higher on some tests of memory, verbal ability, and motor coordination within personal space. Women show greater proficiency and reliance on distinctive landmarks for navigation while males rely on an overall mental map. Some researches have also demonstrated statistically significant medium and short term memory advantages in women (Lynn and Irwing, 2004). On the other hand, large differences favouring males are found in performance on visual-spatial, mental rotation and spatio-temporal tasks. Males are often observed to average higher scores on some tests of spatial ability, mathematical reasoning, and targeting. But all differences related to cognitive ability between female and male disappeared over time. Although

women and men have different biological attributes, the scientific consensus held that gender plays no role in intelligence and cognitive abilities.

2.2. Guilford's structure of intellect model: Convergent thinking - divergent thinking

The notions of convergent and divergent production have a long history in creativity research. According to literature, there are two main styles in creative thinking: convergent thinking and divergent thinking. They were assumed to be part of the Structure of Intellect model (Guilford, 1967). The key distinction between the two classes is that convergent thinking operates in the knowledge domain, whereas divergent thinking operates in the concept domain. Creativity is thus seen as a series of continuous transformations from the concept domain to the knowledge domain. Effective inquiry in creative thinking includes both a convergent component of building up to asking deep reasoning questions by systematically asking lower-level, convergent questions, and a divergent component in which generative questions are asked to create the concepts on which the convergent component can act. A specific answer or a specific set of answers exists for a given question. Generally, the questioner attempts to converge on and reveal "facts". So, answers to converging questions are expected to be hold "truth value", that is, to be verifiable. (Dym, *et al.*, 2005). Convergent thinking emphasizes speed, accuracy, logic, and the like, and focuses on accumulating information, recognizing the familiar, reapplying set techniques, and preserving the already known. Questions that are asked for fostering creative thinking, however, often operate under a diametrically opposite premise: for any given question, there exist multiple alternative known answers, regardless of being true or false, as well as multiple unknown possible answers. The questioner intends to disclose the alternative known answers and do generate the unknown possible ones. Such questions are characteristic of divergent thinking, where the questioner attempts to diverge from facts to the possibilities that can be created from them (Dym, *et al.*, 2005). Although for fostering creative thinking, integrating divergent / convergent patterns of thinking styles is effective, divergent part of the whole is more influential. Most researchers consider divergent thinking and flexibility of thought as central to the act of generating a creative product (Russ, 2002). In this context, divergent thinking can be discussed as major component of creativity. That is the reason why "divergent thinking" with "its five characteristics" is selected as an effective measure of creativity for this comparative gender research.

2.3. Under-representation of girls and woman in creative fields and design related disciplines

The question of gender differences in creative thinking is a complex, controversial and contentious topic. Research examining differences between men and women regarding creativity has tended to focus on differences between the genders in creative output and has been aimed at identifying which gender is more creative. Results of these investigations have been inconsistent and inclusive (Keller *et al.*, 2007). There is little evidence of significant gender differences, and when such differences are found, there is no consistency regarding which groups out-perform which others (Ai, 1999; Kaufman *et al.*, 2010). Some researchers found no statistically significant gender differences and others found gender differences, sometimes favouring women and sometimes favouring men

(Baer and Kaufman, 2008). In some studies, men scored higher on the figural items in general creative thinking measures and women scored higher on the verbal items. In other studies, the opposite pattern was reported (Chan *et al.*, 2001; Hong and Milgram 2010). Baer (1999) reviewed more than 80 studies that compared the scores for divergent thinking for women and men and found that in half of the studies there was no difference, while in about two-thirds of the remaining studies, women or girls scored higher, and in the other third, the men or boys scored higher (Matud, *et al.*, 2007).

Although there are no gender differences in general intelligence and divergent thinking ability, girls and woman remain substantially under-represented in creative fields related to design, science and technology. Females less often study physical sciences, engineering, computer studies and allied fields at every level of education. They are not only underrepresented in a majority of high status professions, but also in such creative areas as music, visual arts and design related disciplines. There are relatively few female role models in creative fields. A great deal of recent scholarship has focused on the fact that the myth of women's lack of creativity is in large part due to the fact that women's creative contributions have not been recorded (Eisler and Montuori, 2007). Research studies in this area have often been either very limited in their focus or quite speculative (and sometimes polemical) in their approach. Torrance (1983) noted that, "The history of human creativity includes few women". With women's under-representation in written history and as participants in studies of extraordinary creativity, it's not surprising that theories from this field tend to neglect women's creativity throughout their life-span. Until recently, discourse about creativity has been almost exclusively by and about one gender: "the male". The justification, when offered, was simply that men are more creative, as evidenced by the fact that the vast majority of important writers, artists, scientists, and inventors have been male (Eisler and Montuori, 2007). There is evidence of gender differences in creative accomplishment, particularly at the highest level, since there have been more geniuses and distinguished men in the science, art, design and technical development than women. In view of the fact that most of the research on creativity has been focused on men, little is known about creative women (Reiss, 2002).

The question is why? Why are women dropping out of the creative issue? It's one scholar has been asking for decades and clearly no consensus has been reached. Researchers have attempted to account for women's under-representation in creative areas by identifying physical and psychological differences, investigating gender roles and stereotypes, and examining the differences in the ways men and women are socialized and how those differences influence both behaviour and career choice. Understanding of creativity in women requires attention to the social world, to individual differences in motivation, and to changes in society over time (Helson, 1990). Both the socialization process and assimilation of the culturally defined gender role schema can also have a critical impact on career decisions.

A gender role is a theoretical construct in the social sciences and humanities that refers to a set of social and behavioural norms that, within a specific culture, are widely considered to be socially appropriate for individuals of a specific gender. Categorizing males and females into social roles creates

binaries, in which individuals feel they have to be at one end of a linear spectrum and must identify themselves as man or woman. Globally, communities interpret biological differences between men and women to create a set of social expectations that define the behaviours that are "appropriate" for men and women and determine women's and men's different access to rights, resources and power in society (Galdas, *et al.* 2010). Although the specific nature and degree of these differences vary from one society to the next, they typically favour men, creating an imbalance in power and gender inequalities in most countries.

The traditional gender roles discourages women from taking an interest in science and applied design related fields. The culture tends to undermine the confidence of women in their ability to compete in creative fields. Literature on men's and women's gender identity development provides evidence of the cultural association of physical science and scientific ways of thinking (reasoning, facts, objectivity) with males and masculinity. On the other hand, feelings, values, and subjectivity are associated with females and femininity. A related consequence of the stereotypical dominator "masculine" and "feminine" socialization is that men have been taught to define their identity in terms of domination and control. Men were more likely to discuss and be attracted to the hands on possibilities (building, trying out ideas in the real world). Although woman were more likely to discuss and be attracted to linking theory and practice about the subject of designing and creating, there are relatively few female role models in creative fields and design related disciplines. Some theorists have explained this phenomenon with the idea of "dependency". According to this view, "women are not trained for freedom at all, but for its categorical opposite, dependency". In fields in which men have predominated, as in the sciences and many of the arts, it has been argued that the relative paucity of women's accomplishments is due entirely to societal constraints. According to gender analyses, modern time's criticism produces a social system that is functioned to suppress, control and exclude women historically. Still, there are enormous obstacles in women's way, obstacles that relate to the very essence of what in dominator systems is considered "masculine" and "feminine" (Eisler and Montuori 2007),

3. Empirical study

3.1. Sampling and procedure

A total of 599 undergraduates from different level of architectural design education took part in this four years comparative study. The sample group consisted of 372 females and 227 males. In order to observe the development of the research and to make a comparison, the first results of the first two years study (Potur and Barkul, 2009) with the sample of 147 undergraduates (88 females and 59 males) from different level of design education were given in the tables.

In this case, SPSS (statistical package for the social sciences) automatically calculated the required formulas and "separate variance estimate" was measured. So, in order to equalize samples, reducing female participant size was not required in this research. The aim of this empirical study is to investigate gender bias in design education through divergent thinking measures that are "fluency", "originality", "abstractness of titles", "elaboration", "resistance to premature closure" as stated in the Structure-of-Intellect model of Guilford. In order to reach more reliable

and valid findings and to expand sample size the comprehensive research lasted four years. In these four years the sample size was increased in order to make the hypothesis test more sensitive.

3.2. Data collection tools

Creativity may be just one facet of overall human cognitive and affective development of which various components can be measured by different methods at various stages of growth. Because of the difficulties of defining the concept of divergent thinking and creativity, the most widely researched and analyzed creative thinking tests which supported by more evidence of validity than any others were employed in this study. As mentioned earlier, Guilford developed a formulation of creativity by distinguishing between convergent and divergent. Generally divergent thinking tasks were used for the measurement of creativity. They were essentially based on the open-ended, multiple-solution format. During the late '50s and into the mid '60s Torrance developed a standardized test to measure creative thinking along divergent thinking dimensions. The Torrance Tests of Creative Thinking (TTCT) has been the most widely used and referenced divergent thinking task. In TTCT creativity test, creative thinking abilities is defined as “the constellation of generalized mental abilities” when creative achievement is practiced. Over the past 45 years, the battery has been used for several research purposes in many countries. Therefore, the reliability and validity of the battery have been studied continuously and thoroughly and generally have been very highly supported. Two decades of research establish the validity and reliability of the TTCT and demonstrate the appropriateness of including divergent measures in a multifaceted approach to assessing creativity. In TTCT, “creative thinking abilities” is defined as “the constellation of generalized mental abilities” when creative achievement is practiced. TTCT tests creativity using 5 norm-referenced measures (fluency, originality, abstractness of titles, elaboration, and resistance to premature closure) and checklist of 13 criterion-referenced measures on creative strengths. TTCT is composed of figural and verbal portions. For the purpose of this research concerned with the designer creativity instead of verbal tasks, figural divergent thinking tasks which composed of three activities (Picture Construction, Picture Completion, Lines) were administered.

The figural TTCT is mainly composed of 3 activities: (1) activity that composes a drawing so that the given curved shape forms a portion of the entire drawing, (2) activity that completes a drawing with given imperfect figures, and (3) activity that makes as many drawings as possible with a set of two lines. Activities reflect personal inclination about respective

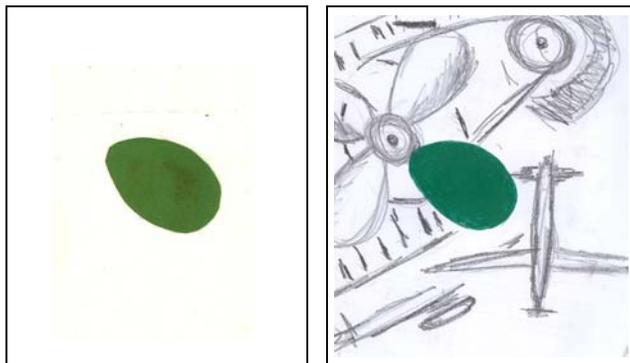


Figure 1. *Picture Construction (First activity)*

characteristics of creative thinking (Torrance, 1990). Each activity designed to tap somewhat different features of creative functioning and each to be completed in less than ten minutes. In the first activity (Picture Construction), participants were given a coloured curved shape, and asked to think of a picture or an object, which they can draw with the shape as a part (Figure 1). They encouraged thinking of as original, a picture

or object as possible and keep adding new ideas to their first idea to make it tell as interesting and as exciting a story as they can. When they have completed their picture or object they have to think up a name or title for it. In the second activity (Picture Completion), participants were given incomplete figures to make and to name an object or a picture (Figure 2). They encouraged creating some objects that no one else could think of. In the last activity (Lines), participants were given three pages of lines which the subject is to use as a part of his or her picture (Figure 3). The pairs of straight lines should be the main part of whatever they make.

All participants were informed that the questionnaire was part of a research. Students were given detailed instructions on how to complete the booklet. Testing in large groups of combined classes is avoided. The maximum class size was 35. The psychological climate, both preceding and during the use of the tests, tried to be as comfortable and stimulating as possible. Both norm (fluency, originality, abstractness of titles, elaboration, resistance to premature closure) and criterion referenced measures were estimated by expert raters. The data were analyzed using the version of SPSS.

3.3. Findings and discussion

Interscorer correlation coefficients for subscales were calculated. Cronbach alpha reliability scores of the both norm and criterion referenced dimensions of TTCT are quite satisfactory (Table 1). Pearson correlations among norm and criterion referenced measures were conducted. The highest correlation was noticed between the correlation on Figural Fluency (FF) and Figural Originality (FO) as 0.95. According to the findings, all correlations are significant at the 0.01 level (2-tailed). When the whole process was examined, the findings of the

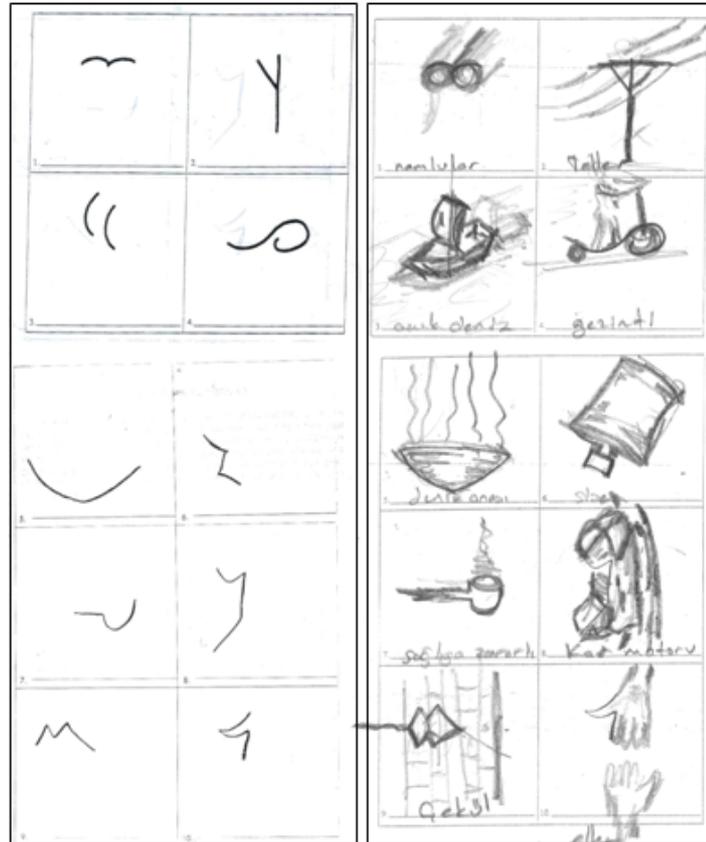


Figure 2. Picture completion (Second activity)

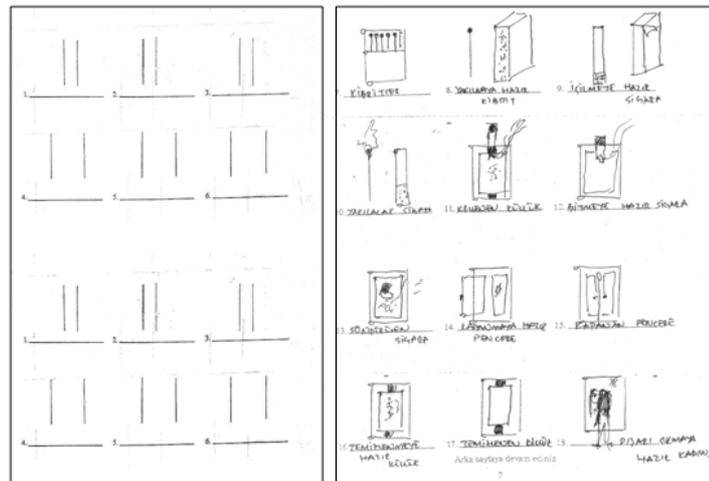


Figure 3. Lines (Third activity)

first two years (Table 2) (Potur and Barkul, 2009) and the entire four years were similar to each other. But more comprehensive findings of four years based on the sample of approximately six hundred person were more reliable and valid with the statistical range of 0.01 level for all norm and criterion referenced dimensions. Although the first two years findings did not show any correlation between some dimensions such as resistance to closure – abstractness of titles and resistance to closure – creative index, statistically meaningful correlations were seen for the same sub scores of the entire four years. These results supported the past research in creativity literature that suggests TTCT is an extensive battery of divergent thinking tasks with highly reliable and valid determination.

Table1. Pearson correlations of the four years (the sample of 599 students)

Pearson Correlations						
	1	2	3	4	5	6
Fluency	1					
Originality	,95**	1				
Abstractness of	,47**	,56**	1			
Elaboration	,86**	,84**	,56**	1		
Resistance to	,47**	,49**	,38**	,60**	1	
Creative Index	,65**	,69**	,58**	,79**	,42**	1

*p<0.05 **p<0.01

Table 2. Pearson Correlations of the first two years (the sample of 147 students)

Pearson Correlations						
	1	2	3	4	5	6
Fluency	1					
Originality	,89**	1				
Abstractness of	,31**	,47**	1			
Elaboration	,64**	,62**	,38**	1		
Resistance to	,28**	,24**		,43**	1	
Creative Index	,55**	,64**	,59**	,59**	,15	1

*p<0.05 **p<0.01

A t-test was conducted with the four years' data in order to test the impacts of gender on creativity. There was not a significant difference among genders (Table 3). When the whole process was examined, the findings of the first two years (Table 4) and the entire four years were similar to each other. The findings of this comparative research not only strengthened the first two years findings but also supported the past research based on divergent thinking and gender perspectives. As mentioned earlier, inconsistent findings have been discovered on gender differences and creativity. With younger students prior to grade three, Tegano and Moran (1989) found a tendency for girls to score higher than boys. However, boys scored higher on originality in grade three. Warren and Luria (1972) found higher scores for girls in early adolescence on figural creativity. Lau and Li (1996) studied 633 Chinese students in grade five in Hong Kong. Among, students, boys were viewed to be more creative than girls. The results of Ruth and Birren's study (1985) showed that, the men performed better than the women on the two creativity tests in which answers pertaining to technical creativity were generated. Torrance (1983) found that gender differences in divergent thinking ability have changed over time. In the 1950's and 1960's boys

outperformed girls on measures of originality, whereas girls surpassed boys on elaboration and most measures of verbal creativity. Additionally, Bruce (1974) report that the gender gap in differences in creativity began to diminish in the 1960's and 1970's. Two studies have compared the associative thinking abilities of male and female subjects using the Remote Associates Test. In a study of adults, there was no significant difference, but in a study of adolescents, girls outscored boys. Reese *et al.* (2001) found that, gender is not an important moderator of the effect of age on divergent thinking. When the results of different studies are evaluated as a whole, it can be said that, gender is evidently not an important determinant of divergent thinking.

Table 3. Four years' t test for equality of means (the sample of 599 students)

t-tests for Equality of Means				
	T	df	Sig (2-tailed)	Difference
Fluency	0,043	599	0,966	0,05
Originality	0,266	599	0,791	0,25
Abstractness of Titles	0,344	599	0,731	0,12
Elaboration	0,544	599	0,586	0,25
Resistance to Closure	0,520	599	0,603	0,10
Creative Index	0,211	599	0,833	0,16

Table 4. First two years' t test for equality of means (the sample of 147 students)

t-tests for Equality of Means				
	T	df	Sig (2-tailed)	Difference
Fluency	1,273	147	0,205	2,23
Originality	1,354	147	0,178	2,35
Abstractness of Titles	1,875	147	0,063	1,66
Elaboration	1,799	147	0,074	0,90
Resistance to Closure	1,599	147	0,112	0,67
Creative Index	1,973	147	0,055	1,57

4. Conclusion and future directions

Findings of this four years comparative study are consistent with the results of the first two years data and most of the previous research (as mentioned in the discussion part). Supporting the psychometric approaches and Baer's extensive review of the literature including more than 80 studies comparing divergent thinking scores of males and females, the findings of this experimental research (with the four years' sample of 599 undergraduates from different level of architectural education) showed that there is not a statistically significant difference between two gender groups according to divergent thinking measures. Results of this study supported most of the others that suggests "gender is evidently not an important determinant of divergent thinking".

Despite all of these scientific proofs, the general tendency tends to undermine the confidence of women in their ability to compete in certain creative fields. As supported by the literature review and experimental study sampling approximately 600 undergraduates there are no gender differences in general intelligence, creativity and divergent thinking. Despite this reality, what can be the reason of the existence of the few

female role models in creative fields and design related disciplines should be explored. The reason of the women's under-representation in these competitive areas may be explained with cultural values, stereotypes and socialization processes. If differences do exist between men and women regarding creativity and related dimensions (quantity of creative work, creative process and creative styles), perhaps these differences are not solely the result of biological factors but sociological factors, including familial and societal expectations regarding creativity and gender role socialization. Feminine and masculine behaviours and attitudes seem to follow cultural patterns. Traditional gender roles may have placed enormous obstacles in the way of women's entry into the creative fields of profession related to design, science and technology. Internal and external blocks to creativity in women should be discussed for the benefits of different kinds of education. Especially additional studies are necessary to investigate what are the other reasons of women's under-representation in the application side of design related disciplines and creative fields across all levels. Research is needed to better understand creativity in the absence of women in studies of eminence. In order to have an opportunity to encourage female students to consider respectable careers in creative fields and design related disciplines, how creativity can be better developed, enhanced, or increased in a diverse population of girls and women should be explored. Understanding of creativity in women requires attention to the social world, to individual differences in motivation and changes in society. The study of gender differences in creative thinking in general needs all of these social directions of attention. More research in this direction might help unveil the mystery of gender differences in creativity for design related disciplines.

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Tasarım eğitiminde cinsiyet değişkenine yönelik bakış açıları: Dört yıllık karşılaştırmalı bir araştırma

Cinsiyet temasına ilişkin göstergeler, cinsiyet karşılaştırma araştırmaları açısından etken işlev görürler. Bir gösterge, herhangi bir işaret olabileceği gibi, özelliği bir durum ya da işleve işaret eden somut gerçekler, algılar, görüşler, ölçekler ya da nümerik değerler de olabilir. Cinsiyet değişkenine ilişkin, çok fazla sayı ve çeşitlilikte göstergenin varlığına rağmen, tasarım eğitiminin gelişimindeki kritik rolü nedeni ile, ıraksak düşünce ile ilgili farklılık araştırmaları oldukça önemlidir. Yaratıcılık olgusuna ilişkin etken bir belirleyici olan ıraksak düşüncenin oldukça karmaşık, tartışmalı ve çelişkili bir tema olması nedeni ile, mimari tasarım eğitiminin sorgulanması açısından faydalanabilir sonuçlar ortaya koyabilecek psikometrik cinsiyet araştırmalarının sayısı oldukça sınırlıdır. Kadınların tasarım disiplinlerinin yaratıcılık gerektiren uygulama alanlarında "temsil" sorununu fiziksel ve psikolojik değişkenlerle tanımlayan çalışmaların varlığına rağmen, mimari tasarım eğitiminde cinsiyet olgusunun ampirik yöntemlerle analiz edilmesi gerekliliği göz ardı edilmiştir. Verileri dört yıllık zaman sürecine dayanan bu karşılaştırmalı araştırmanın örneklemini farklı öğretim düzeylerinden 599 lisans öğrencisi oluşturmaktadır. ıraksak düşünme olgusunun tanım ve analizindeki zorluklar nedeni ile, çalışmanın nesnellüğünün sağlanması açısından, (1) geçerlik ve güvenilirlik düzeyi psikometri literatüründe test edilmiş bir ölçme aracının kullanılması, (2) örneklem sayısının genişletilmesi, (3) ölçeğin "sözlü" formları yerine "şekilsel" formlarının kullanılması olmak üzere üç etken indikatör belirlenmiştir. Araştırmanın gelişiminin gözlenmesi ve karşılaştırma yapmak amacı ile, çalışmanın ilk iki yılının, 147 lisans öğrencisini örneklem alan ilk verileri verilmiştir. İlk iki yılın bulgularına benzer şekilde, örneklem büyüklüğü dört yıllık zamansal süreç içerisinde genişletilen ve yaklaşık altı yüz lisans öğrencisi ile gerçekleştirilen bu çalışmanın sonuçları, yaratıcılığın en etken bileşeni olarak kabul gören "ıraksak düşünme" yeteneğinin, cinsiyet değişkenine göre istatistiksel olarak anlamlı farklılık göstermediğine işaret etmektedir. Bu çalışma, mimarlık eğitimi literatüründe, yaratıcılık olgusunun en etken göstergelerinden olan ıraksak düşünme yeteneğinin cinsiyet değişkenine göre psikometrik yöntemlerle karşılaştırılmasına ilişkin ilk kapsamlı araştırma denemesi olmasına rağmen, bulgular, genel eğitim literatüründeki, cinsiyet değişkeninin bu bağlamda belirleyici bir moderatör olamayacağı kabulü üzerinde birleşen deneysel araştırmaları desteklemektedir. Bu nedenle, birbirini destekleyen deneysel bulgulara rağmen, tasarım disiplinlerinde ve yaratıcılığın etken olduğu alanlarda öncül kadın rol modellerinin sayısının neden sınırlı olduğu sorusu araştırmanın tartışma temalarından biri olarak yer almıştır.