

Gender and creative thinking in education: A theoretical and experimental overview

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Abstract

Students differ from one another in a wide variety of ways. They have different backgrounds, different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices. Research on diversity issues related to creative thinking is quite important in education, since it is most critical to human advancement in science, art and technology. The question of gender differences in creativity is a complex, controversial and contentious topic. 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. For this reason, before the discussion on this case study, in the theoretical construction, diversity issues related to creative thinking research will be discussed in general manner for the benefits of different kinds of education.

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. Subjects consisted of 147 undergraduates from different level of design education. Because of the difficulties of defining and operationalising the concept of divergent thinking, Torrance Tests of Creative Thinking (TTCT) which is an extensive battery of tests devised to measure creative abilities, with a particular emphasis on divergent thinking were administered. The reliability and validity of the TTCT have been studied continuously and thoroughly and generally have been very highly supported. The major findings were that, there were no significant gender-based differences in creative thinking ability. This finding supported some of other studies which claimed that there are no sex differences in overall general intelligence and divergent thinking ability.

Keywords: *Gender comparison, creativity, divergent thinking, architectural education.*

Introduction

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. In other words, indicators provide a close look at the results of initiatives and actions. Bauer (1966) described indicators as "statistical series, and all other forms of evidence that enable us to assess where we stand and where we are going with respect to values and goals, and to evaluate specific programs and determine their impact. Because use of "gender comparison indicators" and other relevant evaluation techniques will lead to a better understanding of how results can be achieved, using gender-sensitive indicators will also feed into more effective future planning and program delivery in education (Girvan, 1997). Although there are several gender indicators in education, research on diversity issues related to creative thinking is quite important, since it is most critical to human advancement in science, art and technology. Because, creativity is that characteristic of human behavior that seems the most mysterious, and yet most critical to human advancement. "Creative thinking" 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.

"Creativity" can be operationalized multidimensional several measures. In spite of existence of these other variables, this study will focus on "divergent thinking measures". According to literature, there are two main styles in creative thinking: convergent thinking and divergent thinking. Convergent thinking is based on familiarity with what is already known, and is most effective in situations where a ready-made answer exists and needs simply to be recalled from stored information, or worked out from what is already known by applying conventional and logic search, recognition and decision – making strategies. By contrast, divergent thinking, involves producing multiple or alternative answers from available information. It requires making unexpected combinations, recognizing links among remote associates, transforming information into unexpected forms and the like (Cross, 1982). That is the reason why "divergent thinking" with "its five characteristics" is selected as an effective measure of creativity for this comparative gender research. The components of divergent thinking (Guilford, 1967) (fluency, originality, abstractness of titles, elaboration and resistance to premature closure) were based on "Structure-of-Intellect model of Guilford".

1. Literature Review

There are some biological differences between women and men. According to Gelman *et al.*, studying hormones and biological dissimilarities, men and women experience the world differently based upon hormones (Gelman, *et al.*, 1981). These researchers do not deny the impact of culture, but resolutely state: "Men and women seem to experience the world differently, not merely because of the ways they were brought up in it, but because they feel it with a different sensitivity of touch, hear it with different aural responses, and puzzle out its problems with different cells in their brains". Conducting brain lateralization studies, researchers generally believe the

female brain is organized to function more symmetrically allowing integration of left and right brain functions more readily than the male brain. Recent studies suggest that there's also evidence, not yet confirmed, that male and female brains may be somewhat differently structured with the two cerebral hemispheres being more specialized and less well interconnected in men than in women. Their ability to shift between and use the two hemispheres is different. There are indications that there may be some differences in brain structure, for example, a thicker corpus callosum connecting the left and right brain hemispheres in women. (Kelley, 1997)

Despite biological differences, for approximately a century a consensus has existed that there are no sex differences in overall general intelligence (Spearman, 1923; Cattell, 1971; Brody, 1992; Jensen and Sinha, 1993; Mackintosh, 1996; Geary, 1998; Collom *et al.*, 2000; Lippa, 2002; Anderson, 2004). Findings of "no sex difference in intelligence" have since been replicated many times on different standardization samples with different test batteries (Jackson and Rushton, 2006). Some sex differences in performance on mathematics tests, which once prompted complex biopsychological theories of innate cognitive differences between males and females, have all but disappeared over time (Sadker, *et al.*, 1991). However, males are often observed to average higher scores on some tests of spatial ability, mathematical reasoning, and targeting, while females are often found to average higher on some tests of memory, verbal ability, and motor coordination within personal space (Halper, 2000; Kimura, 1999). The extent to which sex differences in performance or representation occur varies from country to country.

1.1 Gender Differences in Divergent Thinking

Convergent and divergent thinking were assumed to be part of the Structure of Intellect model, proposed by Guilford in 1956 (Guilford, 1967). The notions of convergent and divergent production have a long history in creativity research. Convergent thinking is primarily concerned with taking in information and producing, or 'converging' on, a single correct answer to the problem. It emphasizes speed, accuracy, logic, and the like, and focuses on accumulating information, recognizing the familiar, reapplying set techniques, and preserving the already known. It is based on familiarity with what is already known, and is most effective in situations where a ready-made answer exists and needs simply to be recalled from stored information, or worked out from what is already known by applying conventional and logical search, recognition and decision-making strategies.

In Guilford's theory of intelligence (1967), divergent thinking is contrasted with convergent thinking in the following way: Divergent thinking is related to creativity, as usually conceptualized, in that both involve the production of a variety of new, original solutions to a problem (Simonton, 2000). Divergent thinking, involves producing multiple or alternative answers from available information. It requires making unexpected combinations, recognizing links among remote associates, transforming information into unexpected forms, and the like. Guilford, saw divergent thinking as major component of creativity and associated it with four main characteristics described as fluency, flexibility, originality and elaboration. Divergent thinking is therefore useful for solving problems that do not have a single, objectively correct solution but rather have several potentially workable solutions whose originality or other kind of value can be assessed. Greater originality is expected if the production of ideas is fluent (many ideas are produced) and

flexible (several categories of ideas are produced). In contrast, convergent thinking is intended to produce a single solution to a problem - not merely the subjectively best solution but the only objectively correct solution. Given this difference, tests of divergent thinking ask for the production of many alternative answers and tests of convergent thinking require arriving at a single true answer. Divergent thinking tests were essentially excluded from Binet's subsequent batteries (Guilford, 1967), the open-ended, multiple-solution format assumed by Binet to facilitate the measurement of imaginative abilities was quickly adopted by early creativity investigators (Barron and Harrington, 1981).

The question of gender differences in creative thinking is a complex, controversial and contentious topic. Although gender differences in creativity were assessed in several studies (Kogan, 1974; Tegano and Moran, 1989; Flaherty, 1992; Boling and Boling 1993; Dudek and Strobel, 1993), the results have been inconsistent. Some researchers found no statistically significant gender differences (Bromley, 1956; Alpaugh and Birren, 1977; Jaquish and Ripple, 1981; Agarwal and Kumari 1982) and others found gender differences, sometimes favouring women (Coone, 1969; Warren and Luria, 1972; Bharadwaj, 1985; Flaherty, 1992; Tegano and Moran, 1989) and sometimes favouring men (Ruth and Birren, 1985). In an extensive review of the literature reveals more than 80 studies, Baer compared divergent thinking scores of males and females. Over half of these studies reported no difference, with about two-thirds of the remaining studies favouring women or girls and one-third favouring men or boys (Baer, 1993).

1.2 Blocks and Barriers

Although there are no sex 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 from elementary school to graduate school (Robertson, 1988). 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. 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 underrepresentation 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. Helson (1990) argued that, the understanding of creativity in women requires attention to the social world, to individual differences in motivation, and to changes in society over time. Both the socialization process and assimilation of the culturally defined gender role schema can also have a critical impact on career decisions. Similarly in a discussion of the social constraints on creativity for women, Hayes (1981) have pointed out that: (1) The culture tends to undermine the confidence of women in their ability to compete in certain creative fields, (2) The culture discourages women from taking an interest in science-related fields, (3) There are relatively few female role models in creative fields, (4) Social pressures and

gender roles encourage women to retain the primary responsibility for the family (Hayes, 1981).

In order to explore self perception of creativity, Kaufman and Baer conducted a survey of more than 2400 men and women. Participants rated their own creativity in 56 different areas. The results showed that, the differences were enormous. In 43 of the 56 domains there were statistically significant differences between male and female subjects. Men self reported higher levels of creativity in such areas of mechanical abilities, physics, and sports strategy (and many other stereotypically male activities), and women self reported higher levels of creativity in such domains as teaching, communicating, interior design. Results suggested that women's and men's self perceptions of creativity is very different in many respects. In a similar research effort, Barron (1972) reported that there are dramatic differences in the self-image of women and men creators. Women and men view their own creativity very differently. Common gender stereotypes has effective role on the self perceptions of creativity. The culture tends to undermine the confidence of women in their ability to compete in creative fields.

The traditional gender roles discourages women from taking an interest in science-related fields. The literature suggests that males and females tend to have different interests and values. Eccles *et al.*, (1983) reviewed numerous studies which showed that females are more likely to be "person oriented" and males are more likely to be "thing oriented" in their interests and values. Allport, Vernon and Lindzey found that males scored higher on scales of theoretical, economic, and political values, whereas females scored higher on scales of social, religious, and aesthetic values (1970). Hansen and Campbell (1985) reported that men scored higher on the scales related to mechanics, science, mathematics, business management and medical science. It was found that males are more likely to report plans to major in mathematics, the physical sciences, engineering and computer science. In order to explore students' interests relating to science and technology, more than 40 researchers from 21 countries have collected information from 10000 students. The results showed that the definition of feminine and masculine behaviors and attitudes seem to follow cultural patterns (Sjøberg, 2000). Traditional gender roles have placed enormous obstacles in defining interests related to creative areas.

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, 1995). Research studies in this area have often been either very limited in their focus or quite speculative (and sometimes polemical) in their approach. MacKinnon's (1975) seminal research focusing on creative personalities and, more recently, Simonton's (1999) work on creative genius articulated creative traits and theories of creative development. Yet, since the great majority of participants in these studies were male, the relevance of these theories to creativity development in women remains in question. 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. Piirto (1991), Ochs (1991) and Simonton (2000) believed that research is needed to better understand creativity in the absence of women in studies of eminence.

2. Method

The aim of this empirical study is to investigate gender bias in design education through creative thinking measures that are “fluency”, “originality”, “abstractness of titles”, “elaboration”, “resistance to premature closure” as stated in the Structure-of-Intellect model of Guilford. A total of 147 undergraduates from different level of architectural design education took part in this study. The sample group consisted of 88 females and 59 males.

2.1 Instrumentation

Because of the difficulties of defining the concept of creativity, two indices were employed in the present study. First, the most widely researched and analyzed creative thinking tests which supported by more evidence of validity than any others were employed. Second, 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.

Torrance Tests of Creative Thinking (TTCT) is an extensive battery of tests devised to measure creative abilities, with a particular emphasis on divergent thinking. The reliability and validity of the TTCT have been studied continuously and thoroughly and generally have been very highly supported. TTCT have shown high reliability ($r > 0.90$) as well as high predictive validity ($r > 0.57$) for future career image and for academic and creative achievements. Torrance and Safer (1989) conducted a 22 year longitudinal study on the predictive validity of this measure, which compared scores from various form of the TTCT with later life creative achievements. Torrance (1990) states that the interrater reliability among the scorers was greater than .90. 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 (Kim, 2006). More than 1500 studies in 16 countries used these tests (Torrance, 1996) and tests have been translated into more than 35 languages since 1966 (Millar, 2002). Statistical studies concerning the language equivalency, reliability and validity of adapting test into Turkish has been developed by Aslan (1999). Interscorer correlation coefficient for subscales (.95 to 1.00) demonstrated that TTCT could be implemented in Turkish culture as well (Yontar, 1992).

2.2 Procedure

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. 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. 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. The pairs of straight lines should be the main part of whatever they make. The TTCT tests were sent

to the expert raters for professional scoring. Five sub scores are provided for Fluency (the ability to produce a large number of ideas), Originality (the ability to produce ideas that are unusual), Abstractness of Titles (level of abstractness given to the titles of the pictures drawn), Elaboration (the ability to develop or embellish an idea), and Resistance to Closure (ability to maintain openness to a variety of options or ideas). A Creativity Index, which is an indicator of overall creative potential, is obtained by averaging the standard scores from each of the subscales and adding the creative strengths ratings (Clapham, 1998). The scoring system used in this research was based on the procedures developed primarily by Torrance (1966) and later on by Torrance *et al.* (1990). Both norm and criterion referenced figural creativity indicators were estimated. The data were analyzed using SPSS statistical package.

3. Results

Interscorer correlation coefficient 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 0.89.

Table 1: Pearson Correlations

Pearson Correlations						
	1	2	3	4	5	6
1. Fluency	1					
2. Originality	.89**	1				
3. Abstractness of Titles	.31**	.47**	1			
4. Elaboration	.64**	.62**	.38**	1		
5. Resistance to Closure	.28**	.24**	.09	.43**	1	
6. Creative Index	.55**	.64**	.59**	.59**	.15	1

*P<0.05 **P<0.01

A t-test was conducted in order to test the impacts of gender on creativity. There was not a significant difference among sexes (Table 2). This result supported other researchers. As mentioned earlier, inconsistent findings have been discovered on gender differences and creativity. With younger students prior to grade three, Kogan (1974) and Tegano and Moran (1989) found a tendency for girls to score higher than boys. However, boys scored higher on originality in grade three. Coone (1969) and 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. Boling and Boling (1993) found first-born males and later born females demonstrated the greatest creativity. Hocevar (1980), used Concept Mastery Test which was scored for creativity in six areas. Females scored significantly higher on the Crafts scale, and males scored significantly higher

on the Math-Science scale. The sex differences on all other creativity scales were not significant. 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) and Torrance (1963) 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 2: *t*-tests for Equality of Means

t-tests for Equality of Means				
	T	df	Sig. (2-tailed)	Difference
Fluency	1,273	145	,205	2,23
Originality	1,354	145	,178	2,35
Abstractness of Titles	1,875	145	,063	1,66
Elaboration	1,799	145	,074	,90
Resistance to Closure	1,599	145	,112	,67
Creative Index	1,973	145	,055	1,57

4. Conclusion

The general tendency tends to undermine the confidence of women in their ability to compete in certain 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. At the same time, 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.”

Findings from this study are consistent with most of the other research (Bromley, 1956; Alpaugh and Birren, 1977; Jaquish and Ripple, 1981; Agarwal and Kumari 1982; Baer 1993). The results of this empirical study that investigates gender differences through divergent thinking measures with the sample of 147 undergraduates from different level of architectural education indicated that there is not a significant difference among genders. This study supported the psychometric approaches and Baer’s extensive review of the literature including more than 80 studies comparing divergent thinking scores of males and females. As mentioned in the “literature review” section, according to Baer’s comprehensive research, over half of the studies reported no difference, with about two-thirds of the remaining studies favouring women or girls and one-third favouring men or boys. The findings of this experimental research in architectural education supported most of the others that suggests “gender is evidently not an important determinant of divergent thinking.”

As supported by this literature review and experimental study sampling approximately one hundred fifty undergraduates, although there are no sex differences in general intelligence, creativity and divergent thinking ability, what is the reason of the existence of the few female role models in creative fields and design related disciplines should be explored. The answer of this question can be reveal by the examination the women’s under-representation in these competitive fields. The reason of the under-representation in these areas may be explained with cultural values, stereotypes and socialization processes. Traditional gender roles may have placed enormous obstacles in the way of women’s entry into the creative fields of education related to design, science and technology. 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. 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 reasons of gender differences in design related disciplines and creative fields across all levels. Also how creativity can be better developed, enhanced, or increased in a diverse population of girls and women should be explored. It is believed that as creativity becomes more ungendered and contextualized, we have an opportunity to encourage young women students to consider careers in creative fields and design related disciplines.

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**Eğitimde yaratıcı düşünce ve cinsiyet:
kuram ve deney tabanlı bir inceleme**

Eğitim alt yapısı, motivasyon seviyesi, öğrenme biçimi gibi çeşitli değişkenler açısından birbirinden oldukça farklı özelliklere sahip olan öğrenciler, belirli

eğitim ortamları ve öğretme tekniklerine karşı farklı tepkiler gösterirler. Özellikle bilim, sanat ve teknoloji gibi bireyin yaratıcı düşünce ile ilişkili olarak bireysel gelişiminin etken olduğu çeşitli disiplinlerde bu farklılıklar daha da önem kazanmaktadır. Bu alanlarda “yaratıcı düşünce” olgusu ile ilgili olarak bireyler arasındaki “çeşitlilik – farklılık” temalarına ilişkin çalışmaların “insanlığın gelişimi” açısından önemli olduğuna dair yaygın bir görüş oluşmuştur. Yaratıcılıkta cinsiyet farklılıkları sorusu sürekli üzerinde tartışılan, karmaşık ve çelişkili bir konudur.

Bu nedenle, bu çalışmanın kuramsal bölümünde, “yaratıcılık ve cinsiyet” olgusuyla ilişkili olarak gerçekleştirilmiş olan çeşitli araştırmalar ve eğitime yansımaları genel anlamda tartışılmış, çalışmanın Mimarlık Bölümü öğrencilerini örneklem alan (147 lisans öğrencisi) deneysel bölümünde ise, yaratıcılığın en etken indikatörü olarak kabul gören “ıraksak düşünme” (divergent thinking) yeteneğine göre cinsiyet farklılaşmalarını analiz eden ampirik araştırma gerçekleştirilmiştir. İraksak düşünme olgusunun doğasının gerektirdiği tanım ve analiz zorluğu nedeni ile araştırmada ölçme aracı olarak, geçerliliği ve güvenilirliği pek çok deneysel araştırma ile test edilmiş olan ve psikometri literatüründe “ıraksak düşünme” yeteneğine yönelik en geniş kapsamlı ölçme aracı olarak kabul edilen Torrance Yaratıcı Düşünce Testi (TTCT) kullanılmıştır. Temelleri, Guilford’un “Zihin Yapısı Modeli” ne (Structure of Intellect Model) dayanan, ıraksak düşünmenin beş bileşenini [akıcılık (fluency), esneklik (flexibility), orijinallik (originality), abstractness of titles (başlıkların soyutluğu), zenginleştirme (elaboration) ve erken kapanmaya direnç (resistance to premature closure)] kapsayan ölçeğin şekilsel yaratıcı düşünme bölümü uygulanmış, gerek norm referanslı gerekse de kriter referanslı değişkenler SPSS programı ile test edilmiştir. Elde edilen bulgulara göre, yaratıcılığın en etken bileşeni olarak kabul gören “ıraksak düşünme” yeteneği, cinsiyet değişkenine göre istatistiksel olarak anlamlı farklılık göstermemektedir.

Çalışma sonucunda ortaya konan bu bulgu, cinsiyet olgusunun ıraksak düşünce açısından etken bir değişken olamayacağı ortak kabulüne ulaşan geçmiş araştırmaları desteklemektedir. Baer (1993), cinsiyet değişkenine göre bireylerin ıraksak düşünce yeteneğini karşılaştıran yaklaşık 80 araştırmaya yönelik geniş kapsamlı literatür taramasında, bu deneysel çalışmaların yarısından çoğunun istatistiksel olarak anlamlı sonuçlar ortaya koymadığını, yaklaşık üçte birinin kadınlar, yaklaşık altıda birinin ise erkekler yönünde farklılık gösterdiğini belirtmiştir. Benzer şekilde, bu çalışmanın literatür taramasında öne çıkan diğer deneysel araştırmalar, cinsiyet değişkeninin ıraksak düşünce üzerinde belirleyici bir moderatör olamayacağı kabulü üzerinde birleşmektedir.

Bu araştırmanın, gerek, örnekleme Mimarlık Bölümü lisans öğrencilerinden oluşan deneysel bölümünde, gerekse de psikometrik yöntemli çalışmaları analiz eden kuramsal bölümünde ortaya konduğu üzere “zeka bileşenleri, yaratıcılık ve ıraksak düşünme yeteneği açısından cinsiyetler arasında istatistiksel olarak anlam ifade edecek farklılık yoktur” genel çıkarımına rağmen, yaratıcılığın etken olduğu alanlarda ve tasarım disiplinlerinde neden öncül kadın örneklerinin sayısının oldukça sınırlı olduğu sorusuna yanıt aramak oldukça önemlidir. Bu sorunun yanıtı, kadınların bu tür yarışmacı disiplinlerdeki “temsil edilme” sorunu ile açıklanabilir. Kültürel değerler, kalıplaşmış tipler ve sosyalizasyon sürecine ilişkin olan bu temsil sorunu cinsiyet rol şeması ile ilişkilidir. Gerek kültür temelli olarak tanımlanan cinsiyet rol şemasına, gerekse de, sosyalleşme sürecine ilişkin asimilasyon,

kariyer yönelimini de etkilemektedir. Modern eleştiride cinsiyet analizi, kadını bastırma, kontrol etme ya da dışlama eylemleri ile tanımlanan bir sosyal sistem ile ifade edilmektedir. Kültürel önyargılar, kadının yaratıcı alanlarda kendisini yönelik algısını olumsuz yönde etkilemektedir. Cinsiyet açısından kimlik gelişimine yönelik literatür, “erilliği” muhakeme, mantık, nesnellik ve gerçek dünya ile ilişkilendirirken, “dişillliği” ise, değerler, duyumsamalar, öznellik ve soyutluk kavramları ile açıklama yönelimindedir. Bu okumada, toplumsallaşma sürecinde erillik ve dişillik kavramları, erkeğe baskın ve kontrol odaklı bir rol yükler. Her ne kadar, kadın rolü için kurgulanmış olan eğilim, soyutlama üstünlüğü ile ilişkili olarak yaratıcılık gerektiren disiplinlerle olumlu yönde ilişkilendirilse de, bu üstünlük, kadınların sanat, bilim, teknoloji alanlarında ve tasarım tabanlı disiplinlerde öncül olabilmesini sağlayamamıştır.

Bu durum, teorisyenler tarafından kadına yönelik toplumsal eğitimin “özgürlük” yerine, kavramın kategorik olarak zıttı kabul edilen “bağımlılık” kavramı ile özdeşleştirilmesi ile açıklanır. Geleneksel cinsiyet rolü, kadının tasarımcı düşünme biçimi gerektiren yaratıcı alanlardaki varlığı açısından oldukça etken bir engeldir. Bu nedenle, gerek eğitim gerekse de uygulama alanında kadının ıraksak düşünce üretme sürecine ilişkin içsel ve dışsal engellerin tartışılması, sadece tasarıma ilişkin disiplinler için değil, yaratıcılık gerektiren tüm alanlar açısından önemlidir. Özellikle “merkez” ve “çeper” karşıtlığında, kadının “öteki” olarak ifadelendirilen toplumsal kodla temsil edilme sorununu engelleyebilmek için, yaratıcılık gerektiren disiplinlere yönelik eğitim alanında, ıraksak düşüncenin arttırılmasına ilişkin çalışmalara kız öğrenciler açısından daha da önem verilmesi gerekmektedir. Kalıplaşmış cinsiyet rol şemalarını yıkmak, kendilerine yönelik yaratıcılık algılarını geliştirme, kavramsallaştırma yeteneklerini iyileştirilme gibi hedefler, eğitim ortamında, özellikle kız öğrenciler açısından cesaret verici bir tutumla gerçekleştirildiğinde, eğitim alanının yanı sıra, uygulama alanında da, yaratıcı düşüncenin etkin olduğu öncül düşünce ve ürünlerin ortaya konabilmesi sağlanabilecektir.