Opinions of Academics on the Relation Between Mathematics and Creativity

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Abstract

Mathematics and creativity are two concepts that are not independent of each other. These two concepts have a major role in improving creative, critical, inquisitive and multidimensional thinking skills. Educators are highly important in teaching and improving critical thinking skills as well as mathematical skills which we face in every sphere of life. ***Aims:*** *This study, which is based on this ideology, aims to reveal the opinions of academics on the relation between mathematics and creativity.* ***Method:*** *The participants of the study is composed of 103 academics working in the education faculties of universities. The responses of the academics to the research question were subjected to content analysis.* ***Findings:*** *The results of the analysis revealed that the responses of the academics (n=100) who pointed to a relation between mathematics and creativity can be grouped into four themes (common skills, flexibility, originality, common intelligence types).* ***Result:*** *The responses of the academics regarding the relation between mathematics and creativity revealed that the themes developed from the responses coincide with those in the literature.*

Keywords: *Creativity and mathematics, academics, content analysis*

Öğretim Elemanlarının Matematik ve Yaratıcılık Arasındaki İlişkiye Yönelik Görüşleri

Özet

Matematik ve yaratıcılık birbirinden bağımsız olmayan iki kavramdır. Bu iki kavramın yaratıcı, eleştirel, sorgulayıcı ve çok boyutlu düşünme becerilerinin geliştirilmesinde büyük rolü vardır. Hayatın her alanında karşılaştığımız matematiksel becerilerin yanı sıra eleştirel düşünme becerilerinin öğretilmesinde ve geliştirilmesinde eğitimciler son derece önemlidir. ***Amaç:*** *Bu önemden yola çıkılarak yürütülen bu çalışma, akademisyenlerin matematik ve yaratıcılık arasındaki ilişkiye ilişkin görüşlerini ortaya koymayı amaçlamaktadır.* ***Yöntem:*** *Araştırmanın örneklemi, üniversitelerin eğitim fakültelerinde görev yapan 103 akademisyenden oluşmakta olup akademisyenlerin araştırma sorusuna verdikleri cevaplar içerik analizi yöntemi ile analiz edilmiştir.* ***Bulgular:*** *Analiz sonuçları, matematik ve yaratıcılık arasındaki ilişkiye işaret eden akademisyenlerin (n=100) yanıtlarının dört temada (ortak beceriler, esneklik, özgünlük, ortak zeka türleri) gruplandırılabileceğini ortaya koymuştur.* ***Sonuç:*** *Akademisyenlerin matematik ve yaratıcılık ilişkisine ilişkin verdikleri yanıtların ve*

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akademisyenlerin görüşlerinden yola çıkılarak geliştirilen temaların alan yazındaki temalarla örtüştüğü sonucuna ulaşılmıştır.

Anahtar kelimeler: *Matematik ve yaratıcılık, öğretim elemanları, içerik analizi*

Introduction

Investigation of a problem or problem solving skills are mostly considered as a creative activity of an individual or as an extraordinary skill. While Hadamard (1945) argues that framing a research question in the field of mathematics requires extraordinary skills, Polya (1962) defines mathematics as an accumulation of knowledge which is necessary to solve the problems that require independence, reasoning, originality and creativity. Related to the definition of mathematic, Runco (2008) described creativity as a multifaceted construct involving "divergent and convergent thinking, problem finding and problem solving, self-expression, intrinsic motivation, a questioning attitude, and self-confidence" (p. 9). Mathematical creativity, on the other hand, refers to the ways of solution to various problems, the proof and theories proposed for a problem, and finding original solutions to the non-standard problem solutions (Krutetskii, 1976). According to Ervynck (1991), mathematical creativity emerges as a result of the relation between the skills of comprehension, perception, relating and generalization, and mathematical creativity brings enlightenment, depth, sensitivity, efficiency and originality with itself. As Prouse (1964) maintains, creative mathematicians concentrate on the problems about the topics and situations that do not attract the attention or arouse the curiosity of other people, and they have a strong imagination about the presence of entities in space, which is related to their three-dimensional thinking ability. Thus, creative mathematicians can find many clever, unusual and acceptable solutions to a problem (Haylock, 1987). Developing the ability of individuals to be flexible in their problem-solving approach is also necessary for the development of creativity. For example, instead of the standard solution proposals used to solve a problem, a flexible thinker may first examine the first solution or may try to establish connections with the other mathematical fields like statistics, algebra and probability in order to reach the solution through a more efficient approach (Mann et al., 2016). While mathematics and creativity are thought to be related only in terms of flexibility, fluency and originality for several years (Haylock, 1997; Imai, 2000; Kim et al., 2003; Mann, 2006; Tuli, 1980). Flexibility is related to generating different ideas and using variety of solutions, fluency is associated with continuity of ideas and originality is characterized by uniqueness, unconventional and creating new ideas (Lev-Zamir & Leikina, 2011). Elaboration concerns the ability of an individual to provide depth beyond the answers standard problem solvers can give in explaining a problem. Individuals with a high level of elaboration ability can define and explain the complexity of a solution others cannot define. When the literature is reviewed, it is seen that creativity and/or the dimensions of creativity are found in the definitions of mathematics. Thus, these two concepts or disciplines which are not completely

independent of each other and a well-planned creative mathematics education have a significant role in developing the creative, critical, inquisitive and multidimensional thinking skills of children. Although ideas about mathematics in children are generated long before formal education begins, teachers undoubtedly play an active role in children's being creative and inquisitive individuals who can think critically and share their ideas (Kuru, 2021).

The role of the teacher is the most important stimulus to creating an effective teaching atmosphere in the classroom, to enabling students to develop creative personality characteristics, and also to encouraging students to think originally (Mrayyan, 2016). Educators should provide appropriate reinforcement for original interpretations and ideas, along with opportunities and models for original and creative behavior (Runco, 2008). As far as the relation between teacher behavior and student learning is concerned, it is known that teacher's ensuring some aspects of the classroom like verbal dialog, classroom management, clarity of the purpose, organization of the topic, the way of determining the appropriate strategies, asking and answering questions, and the lesson planning method facilitate student learning. In this way, provide an environment for creativity in education requires teachers to understand creative learning opportunities that help students discover their strengths and weaknesses (Gurak-Ozdemir et al., 2019; Torrance, 1979). A teacher who does not have the competence to develop creativity cannot do anything in this respect (Cropley, 2002; Mrayyan, 2016; NCTM, 2000; Runco, 2008). According to Csikszentmihalyi (1990, 1996), environment plays an important role in enhancing creativity of students. From this point of view, educators are of great significance in the improvement and teaching of mathematics and creativity thinking ability which is faced in every area of life. This study which was carried out based on this fact aims to reveal the opinions of academics teaching in the teacher training programs of universities on the relation between mathematics and creativity. Some studies have so far been conducted to explore the effect of teachers on mathematics and creativity (Arikan, 2017; Schoevers et al., 2019). However, no studies have yet investigated the opinions of academics who are the most effective role in preparing teacher candidates for teaching profession. In this respect, we aim to explore the opinions of academics on the relationship between these two concepts in regard to areas of expertise.

Method

Research Model

This study is designed to add to body of research related to relationship between mathematics and creativity. For this purpose, study adopted qualitative content analysis approach and relied on qualitative methods of data collection and analysis. This approach has been known to offer a comprehensive summary of a given phenomenon (Potter & Levine-Donnerstein, 1999).

Participants

The participants were recruited through a snowball sampling strategy using an online survey platform (Google Form-Google). Participant's inclusion criteria were: had PhD degree and employed faculty of education. Participants in the study were excluded because they did not respond or fulfill the survey question. A total of 103 academics (female, n= 55, 53.3%; male, n=48, 46.6%) employee in different universities in Turkey was included in this study. The areas of expertise of the academics are given in Table 1.

Table 1.

Academics' Areas of Expertise (N=103)

Area of expertise	***f***
Computer and Instructional Technologies	12
Assessment and Evaluation in Education	13
Curriculum and Instruction	8
Elementary Science Education	10
Classroom Teaching Education	13
Elementary Mathematics Education	11
Early Childhood Education	17
Psychological Counseling and Guidance	11
Secondary Science and Mathematics Education	8
Total	103

Data Collection Tool and the Procedure

A survey was developed for data collection purposes. The data was collected from the academics working in the Computer and Instructional Technologies, Assessment and Evaluation in Education, Curriculum and Instruction, Elementary Science Education, Classroom Teaching Education, Elementary Mathematics Education, Early Childhood Education, Psychological Counseling and Guidance, and Secondary Science and Mathematics Education (Biology, Physics, Mathematics, Chemistry Education) departments of different universities. Google Form was used to collect the survey data . The survey, which was published online was open to access for a month. The survey is composed of two parts. Part I includes questions to collect personal information like gender and area of expertise, while Part II involves the research

question (There is/is not a relation between mathematics and creativity because .....). After receiving Institutional Review Board approval, an informative letter, reporting the main purpose of the study, was sent to the academics via email. The letter included also the link to the google form, openly accessible to the academics. The survey was sent to 186 academics via email and 103 academics answered the survey questions fully.

Ethical Consideration

An author provided written explanations to all study participants on the study procedure and how their personal information would be handled. We then obtained participants written informed consent. This study was conducted with the approval of the ethical review board of the Hacettepe University**.**

Trustworthiness

To ensure the trustworthiness of qualitative data used Lincoln and Guba (1985) criteria. First, to bolster its credibility, we tried to diversify our sample in terms of professional background and institutions. In this way, we aimed to obtain various definitions and viewpoints in order to construct a rich picture of the studied phenomenon (Shenton, 2004). Second, we reported a substantial number of quotes from the participants to support the transferability of the study results (Korstjens & Moser, 2018). Third, peer checking was carried out by the authors and two doctoral researchers with expertise in qualitative research (Patton, 1999). Lastly, we ensured the dependability of the study by providing a detailed methodological description, allowing the reader to replicate the study (Shenton, 2004). Additionally, through the use of NVivo 11 software, the specific number of references made by participants used to construct a theme is made apparent.

Data Analysis

The responses of the participants were subjected to content analysis as the study was designed as a qualitative study. The data were analyzed employing the qualitative content analysis method (Braun & Clarke, 2006), that involved identifying relevant themes and developing appropriate categories performed in NVivo software. According to Braun and Clarke (2006) phases of the analysis consist of six steps. These are: Interpreting data, generating initial codes, determining the themes, reviewing themes, organizing the data according to the themes and codes, reporting the result (see figure 1). In this sense the researchers followed the steps stated by Braun and Clarke (2006).

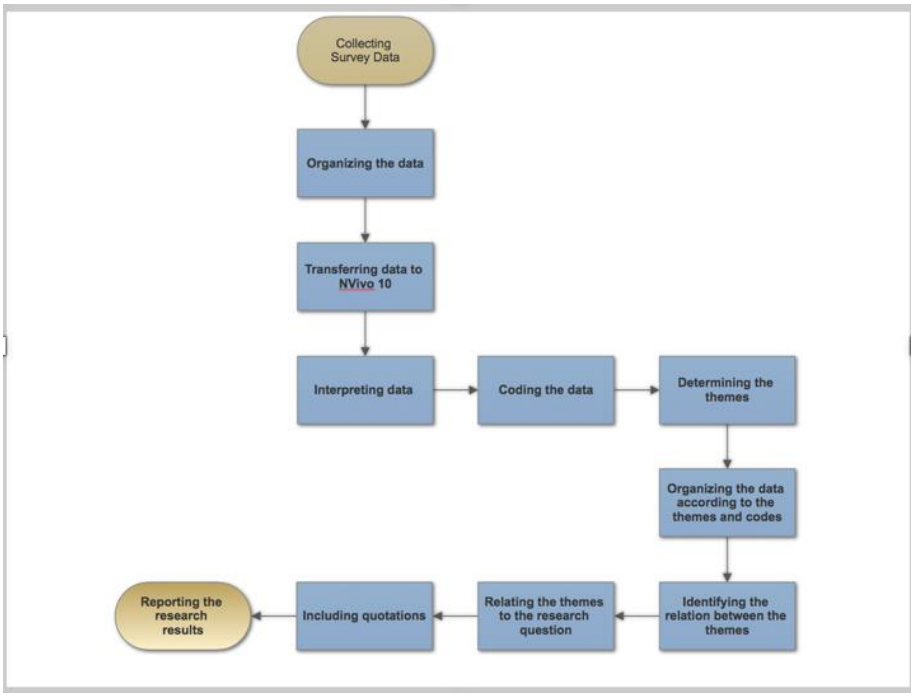

Figure 1: Stages in data analysis

Findings

In the study, 103 academics were asked to reveal their opinions regarding the relation between mathematics and creativity through a survey involving an open-ended question. Among the participants, 100 academics pointed to a relation between mathematics and creativity, whereas for three academics (department of Classroom Teaching Education and Psychological Counseling and Guidance) no relation exists between these two concepts. The responses of the academics were grouped into four themes shown in Table 2.

Table 2.

There is a Relation Between Mathematics and Creativity Because... (N=100)

Themes	*f*
Common skill	
Creative thinking ability	12
Critical thinking ability	6
Problem solving ability	13
Alternative /multidimensional thinking skill	19
Analytical thinking skill	8
Abstract thinking skill	10
Flexibility	
Trying different ways in reaching the truth	16
Ability to look at problem solution from different perspectives	14
Flexibility	22
Generating multiple solutions to solve problems	11
Originality	
Planning new methods and techniques	12
Finding unique answers	4
Original perspective	16
Creating new theorems	6
Common intelligence types	
Visual (spatial) intelligence	9
Analytical intelligence	6

Below are some of the quotations by the academics with respect to the statement "There is a relation between mathematics and creativity because....":

The 63 academics expressed that "flexibility" as a common context mediates the relationship between mathematics and creativity (see Extract 1).

Extract 1

Academic 17: There is a relation because diversification of possible solutions beyond standard methods and creation of alternative solutions to problems through different ways of solution can be possible by managing mathematical processes. Trying to explore new ways for mathematical solutions may help think creatively.

Out of the 103 academics, 15 academics expressed that they emphasized a relation in the one of the common points level of "common intelligent type" between mathematic and creativity (see Extract 2).

Extract 2

Academic 25**:** There is an important relation between mathematics and creativity because using creativity is important for students to learn mathematics better and to make this skill permanent. Put differently, there are many solutions for each problem in the Mathematics course. Students identify these solutions, choose one of them, implement it and then check it. The point that students need to realize is that there is not a single solution to a problem. At this point, students need to use their creativity ability. Thus, I believe there is a significant relation. This could also be generalized to visual intelligence in mathematics and creativity.

68 academics highlighted "common skills" in the relationship between creativity and mathematics. One of the academics draws attention to this aspect between the two concepts in the quote below (see Extract 3).

Extract 3

Academic 38: There is a relation between mathematics and creativity because mathematics encourages students to try different methods. They do not look at the problem from a single perspective during the solution process; they review tens of methods and use them one by one from the most practical to the most challenging. When these methods are used, the occurrence of unknown conditions, that is, the solution to an unknown problem encourages the individual to think and try different ways. Thus, it may promote creativity. This is just a personal foresight, a hypothesis. Testing this with an experiment may contribute to the field.

"Originality" was emphasized by academics as the reason of the relationship between mathematics and creativity (see Extract 4).

Extract 4

Academic 46: There is a relation because mathematics provides a flexible thinking environment and allows students to produce original ideas.

As the last quote from academic also highlight several themes such as "originality", "flexibility" and "common skills" (see Extract 5).

Extract 5

Academic 76: There is a relation because solving mathematics problems or applying them in daily life requires high level creative thinking skill. Also, what we mean by mathematics is not problems involving four operations but generating solutions to unusual situations (problems).

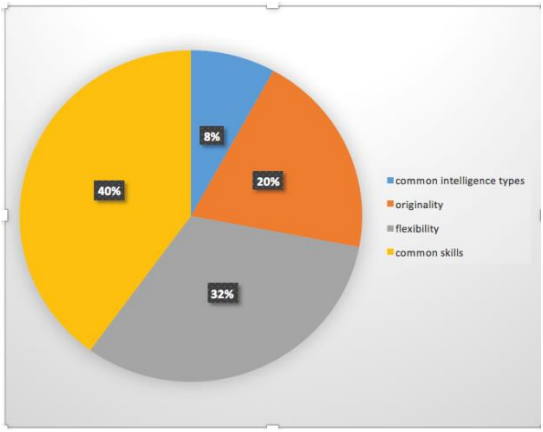

Figure 2: Percentage of themes

When the pie chart above is examined, it is seen that "common skills", "flexibility", "originality", and "common intelligence types" make up the 40%, 32%, 20%, and 8% of the themes, respectively.

The three academics who responded to the open-ended research statement as "There is not a relation between mathematics and creativity because....." cited the following reasons:

Extract 6

Academic 12: There is no relation because mathematics robotizes individuals. As traditional teaching methods are used in mathematics (1*1=1 right-angled triangle area calculation etc.), it is not very possible to use creativity.

Extract 7

Academic 101: There is not a relation. Mathematics is composed of formulas and calculations. Creativity, on the other hand, involves interpretation and subjective opinions. Mathematics is not subjective; it is objective. It does not change from person to person; it involves rules.

Extract 8

Academic 35: These two concepts are not related because mathematics is a discipline, whereas creativity is a psychological trait.

When the responses given by the academics regarding the relation between mathematics and creativity were examined with respect to the academics' areas of expertise, it was found that there is not a difference between the conceptual understanding of the academics as far as their expertise is concerned. It was revealed

that academics in the field of early childhood education focused more on the themes of "originality" and "flexibility", while academics in the field of elementary mathematics education concentrated more on "common intelligence types" and "problem-solving skill" under the theme of common skills in their responses compared to the academics in the other areas of expertise.

Discussion and Conclusion

This study aimed to broaden the knowledge of relational factors for associated with mathematics and creativity, by identifying academics who were PhD, employee in education faculty and almost equally represented by females and males. In addition to the studies conducted with teachers, the presented study served the purpose of getting to know the the opinion of participated group of academics about creativity and mathematics for its relational factors. To that end, the results of the study show that academics who were targeted source of valuable information tended to have a positive perception towards relationship between in mathematics and creativity. The most common subjective reactions to and comments on the relationship between two concepts were statements on themes of "common skills". Moreover, "originality", "fluency" and "common intelligence type" mentioned by academics had occurred as another important themes. According to the literature, studies also assert that mathematics and creativity involve some phenomena like flexibility, originality, problem solving skill, creative thinking skill, and fluency (Haylock, 1997; Kim et al., 2003; Mann et al., 2016; Tuli, 1980). On the other hand, in present study academics did not mention the capacity of deepening (elaboration) which was highlighted in the current literature of mathematics and creativity as well (Lev-Zamir &Leikin, 2011).

The literature highlighted the necessity of integrating creativity into the mathematics programs as well (Guilford, 1962; Leikin, 2009; Sriraman, 2005; Torrance, 1979). Researchers have also maintained that while learning mathematics, individuals should question, try alternative ways to reach the result, and have analytical thinking ability, which contributes to the improvement of their mathematical skills (Sheffield, 2009). When the responses of the academics in present study were examined, it was observed that their opinions regarding the relation between mathematics and creativity coincide with those cited in the literature. Furthermore, the recent studies in the field of education have focused on the theories of multiple intelligences although there is no clear definition in the literature about the theme of common intelligence types cited by the academics. According to the previous study findings based on the multiple intelligence theories, mathematical concepts can be better understood by children through mathematics education which is planned considering the intelligence types of students (Gardner, 1999; Köroğlu & Yeşildere, 2004). It was observed that the academics in our study focused only on analytical intelligence and spatial intelligence among all the intelligence types. This may be attributed to the fact that analytical intelligence involves the skills of forming a reason-result relation between the situations, high level comprehension, and looking at the situations or events not from

a single perspective but from a broader perspective; and to the fact that spatial intelligence involves the skills of seeing the details, thinking visually, expressing shape/space properties with shapes and graphs, and drawing, painting and shaping.

As a result, the responses of the academics regarding the relation between mathematics and creativity revealed that the themes developed from the responses coincide with those in the literature. The academics who believe mathematics and creativity are not related argued that mathematics includes traditional teaching techniques and some basic rules and that it is a subjective discipline. These reasons cited by a limited number of academics in our study do not coincide with the findings of the other studies in the literature (Imai, 2000; Leikin, 2009; Mann et al., 2016; Mann, 2006; Sriraman, 2005).

Limitation and Future Directions

This study proves that it has supplied a lot of useful information related to the academics' perspectives on mathematics and creativity. This study did not provide formal interviews with other stakeholders such as teachers, students, program makers or administrators on the relationship between the concepts. Future studies should focus on this professional group with multiple perspectives on the same phenomenon. Results of this research offer hope of narrowing the study gap through continued interviews centered on successful practices, quality curriculum, and good teaching strategy.

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Conflict of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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Genişletilmiş Özet

Bir sorunun ortaya çıkarılmasının veya bir problem bulgusunun, çoğu zaman insanın yaratıcı aktivitesi veya olağanüstü yeteneği olarak ele alındığını söylemek mümkündür. Matematik ve yaratıcılık; teknik ve uygulama alanlarındaki benzerlikleri fark etme ve ortaya atılmış, birbiri ile ilişkisi bulunmayan fikirler arasında bağlantı kurma yeteneğini içermektedir. Matematiksel yaratıcılık ise; problemlerin çözüm yollarına, probleme dair kanıt ve teorilere, standart olmayan problem çözümlerine orijinal çözüm yolları bulmayı ifade etmektedir. Matematiksel yaratıcılık, anlama, sezme, ilişki kurma ve genelleme yeteneklerinin birbirleriyle ilişkisi sonucunda ortaya çıkmakta ve matematiksel yaratıcılık sonucunda aydınlanma, derinlik, duyarlılık, verimlilik ve orijinallik oluşmaktadır. Bireylerin, problem çözme yaklaşımında esnek olma becerisini geliştirmek aynı zamanda yaratıcılığın gelişimi için de gereklidir. Örneğin, esnek bir düşünür; problem çözmek için kullanılan standart çözüm önerileri yerine daha etkin bir yaklaşımla sonuca ulaşabilmek için öncelikle ilk çözümü gözden geçirebilir veya istatistik, cebir ve olasılık gibi diğer matematiksel alanlarla bağlantılar kurmaya çalışabilir. Matematik ile yaratıcılığın birkaç yıl boyunca sadece esneklik, akıcılık ve özgünlük açısından ilişkili olduğu düşünülürken son yıllarda detaylandırma (ayrıntılandırma) kavramının da matematiğin yaratıcılığına bağlı olduğu görülmüştür. Ayrıntılandırma, bireyin bir problemi açıklamada standart problem çözücülerin verebileceği cevapların ötesinde derinliği sağlama yeteneği ile ilgilidir. Yüksek derecede ayrıntılama becerisine sahip bireyler, diğer bireylerin tanımlayamayacağı bir çözümün karmaşıklığını tanımlayabilir ve açıklayabilir. Alan yazın incelendiğinde matematiğe dair yapılan tanımlamalarda yaratıcılığa ve/veya yaratıcılığın boyutlarına da yer verildiği görülmüştür. Bu nedenle birbirinden tamamen bağımsız olmayan bu iki kavram veya disiplinin; çocukların yaratıcı, eleştirel, sorgulayıcı, çok boyutlu düşünme becerilerini geliştirebilmelerinde, iyi planlanmış yaratıcı bir matematik eğitiminin oldukça önemli olduğunu söylemek mümkündür.

Çocuklarda matematikle ilgili fikirler formal eğitime başlamadan çok önce oluşsa da; yaratıcı ve eleştirel düşünen, sorgulayan, fikirlerini paylaşabilen bireyler olabilmelerinde kuşkusuz öğretmenler etkin rol oynamaktadır. Öğretmenin rolü, sınıfta etkili öğretim iklimi yaratmada ve öğrencilerin yaratıcı kişilik karakterleri geliştirmelerini sağlamada ve aynı zamanda öğrenciyi özgün düşünmeye sevk etmede en önemli uyarandır. Öğretmen davranışı ile öğrenci öğrenimi arasındaki ilişkide öğretmenin; sözlü diyalogu, sınıf yönetimi, konunun organizasyonu, uygun stratejileri belirleme, soru sorma, öğrencilerin sorularına cevap verme şekli, ders planlama metodu gibi sınıftaki bazı özelliklerin başarılması öğrencilerin öğrenmelerine katkı sağlar. Yaratıcılığın gelişimi için gerekli yetkinliğe sahip olmayan öğretmen ise, yaratıcı düşüncenin gelişimini desteklemede yetersiz kalır. Yaşamın her alanında karşımıza çıkan matematik ve aynı zamanda bir düşünme becerisi de olan yaratıcı düşünme becerisinin geliştirilmesinde ve öğretilmesinde eğitimciler oldukça önemlidir. Bu noktadan yola çıkılarak yürütülen bu araştırmada; üniversitelerin

öğretmen yetiştirme programlarında görev yapan öğretim elemanlarının matematik ve yaratıcılık arasındaki ilişkiye yönelik görüşlerini ortaya çıkarmak amaçlanmıştır. Alan yazın incelendiğinde, öğretmenlerin matematik ve yaratıcılık üzerindeki etkisine ilişkin araştırmalara rastlanmış ancak öğretmen adaylarını öğretmenlik mesleğine hazırlamada en etkin unsur olan öğretim elemanlarının matematik ve yaratıcılık arasındaki ilişkiye yönelik görüşlerini saptamaya ilişkin herhangi bir araştırmaya rastlanamamıştır. Bu nedenle yapılan bu araştırma öğretim elemanlarının, matematik ve yaratıcılık arasındaki ilişkiye yönelik görüşlerini ortaya çıkaran ilk araştırma olması açısından oldukça önemlidir. Araştırmanın çalışma grubunu Türkiye'nin çeşitli üniversitelerinde görev yapan 103 öğretim elemanı oluşturmaktadır. Araştırmanın verileri Google Form aracılığı ile toplanmıştır. Anket bir ay boyunca çevrimiçi olarak yayınlanmış ve bir ay boyunca katılımcı cevapları kabul edilmiştir. Anket 186 öğretim elemanına e-mail yoluyla iletilmiş ve öğretim elemanlarından 103'ü araştırma sorusuna tamamıyla cevap vermiştir. Verilerin analizinde katılımcı cevapları incelenmiş ve veriler NVivo programı kullanılarak içerik analiz yöntemi ile analiz edilmiştir.

Araştırmada 103 öğretim elemanının açık uçlu sorudan oluşan anket yoluyla matematik ve yaratıcılık arasındaki ilişkiye yönelik görüşleri alınmıştır. 100 öğretim elemanı matematik ile yaratıcılık arasında ilişki olduğunu, 3 öğretim elemanı ise bir ilişki olmadığını belirtmişlerdir. Öğretim elemanlarının matematik ve yaratıcılık arasındaki ilişkiye yönelik temalarının % 40'nı "ortak beceriler", %32'sini "esneklik", % 20'sini "özgünlük" ve %8'ni "ortak zeka alanları" temalarının oluşturduğu görülmektedir. Öğretim elemanlarının uzmanlık alanlarına göre matematik ve yaratıcılık arasındaki ilişkiye yönelik cevapları incelendiğinde; uzmanlık alanlarına göre iki kavramın ortak becerilerine ilişkin verilen cevaplarda bir farklılık olmadığı sonucuna ulaşılmıştır. Bunun yanı sıra okul öncesi eğitimi anabilim dalında görev yapan öğretim elamanlarının "özgünlük" ve "esneklik" temalarına; ilköğretim matematik eğitimi anabilim dalında görev yapan öğretim elamanlarının ise "ortak zeka alanlarına" ve ortak beceriler teması altında yer alan "problem çözme becerisine" cevaplarına diğer uzmanlık alanlarında çalışan öğretim elamanlarına göre daha fazla yer verdikleri görülmüştür.

Sonuç olarak öğretim elemanlarının matematik ve yaratıcılık arasındaki ilişkiye yönelik vermiş olduğu cevaplar incelendiğinde cevaplara ilişkin oluşturulan temaların alan yazın ile paralellik gösterdiği sonucuna ulaşılmıştır. Matematik ve yaratıcılık arasında bir ilişki olmadığını belirten öğretim elemanları ise gerekçe olarak; matematiğin geleneksel öğretim yollarını içermesini, nesnel oluşunu, temel kuralları içermesini ve bir disiplin oluşunu öne sürmüşlerdir. Öğretim elemanlarının belirtmiş olduğu bu görüşlerin ise alan yazın ile örtüşmediğini söylemek mümkündür.