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The Effect of Using the Creative Reversal Act in Science Education on Middle School Students' Creativity Levels[1]

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ABSTRACT

Purpose: The purpose of this study is to examine the effects of the creative reversal act (CREACT) used in teaching ecosystems topics on the creativity levels of middle school students. **Research Methods**: The research was conducted using a quasi-experimental design, a quantitative research method, and a pretest–posttest control group design. The sample of the study was comprised of 39 students in two groups. The quantitative data were analyzed using the dependent and independent samples t-tests in SPSS software. **Findings**: There was a significant difference between the experimental group, which underwent creative reversal act training, and the control group, which underwent curriculum-based training in terms of creativity scores. The experimental group had higher scores than the control group. There was a significant difference between the two groups in terms of the subcomponents of creativity (fluency, flexibility, originality, and elaboration). The experimental group was more successful in terms of fluency, flexibility, originality, and elaboration. There was a significant difference between the creativity pre- and post-test scores of the experimental group, who obtained higher scores on the post-test. **Implications for Research and Practice**: The results have revealed that the practice of creative reversal act technique in the teaching of a science subject (ecosystem) promoted the creativity level of seventh graders. The results of such programs whose effectiveness have been tested with regard to creativity training demonstrate that student creativity can be improved. Creating classroom environments in which creativity is highlighted and used is important in terms of increasing the quality of education.

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Introduction

The extent to which individuals in a society can be creative is the one of the leading societal questions of the 21st century. Individual creativity, that is, the ability to create original ideas, is the key to contributing to the development of society and increasing its welfare (Davies et al., 2013). While brilliant ideas can mean effective solutions for complex problems, they also have the potential to be transformed into a product with good market share. Promoting creativity and, thus, its quality, is connected to the field of "education" and points to "creativity training," whereby quality is valued rather than giving importance to solely theoretical knowledge and meeting standards.

While Torrance (1968) defined the concept of creativity, which has been investigated by many international researchers for years as being sensitive to disorders and disharmony, determining difficulties, searching for solutions, making predictions, and forming or retesting hypotheses about the deficiencies (as cited in Sungur, 1997), Kirisoglu (2002) regarded it as the product of a multi-dimensional thinking mind. Bentley (1999) regarded creativity as a process through which information is received, shaped, and reshaped until a new product or idea is formed. In addition, creativity is not only producing an original work, but also constructing new syntheses from existing knowledge and, thus, producing different solutions to problems (Koray, 2003). Creativity, which has been regarded as a multi-dimensional concept, is also conceptualized as divergent thinking and creative expert performance (An, Song and Carr, 2016). Creativity is not a property that only artists and scientists can achieve. Although it is unclear whether creativity is innate or acquired, everybody possesses this trait to some extent. It is acknowledged that creativity exists in both cases. Throughout history, many people have had the combination of high intelligence and superior creativity. It has been observed that, with a set objective and enough motivation, these individuals created many innovations that facilitated human lives (Koray, 2003). The first examples that come to mind include Avicenna, Ibn Khaldun, Al-Farabi, Edison, Maxvell, and Einstein, who had superior creativity and intelligence.

While it is commonly agreed that the creative ability is innate, it has also been discovered that it can be improved. Creative development can be achieved by both formal and informal education. In addition, creativity training can be employed in a variety of fields, such as science, education, art, business, and engineering (Conner, 1998; Ihsen, 1998). It has been demonstrated that, given the opportunity to exploit and process creativity through programs to develop the creative potential in almost every field, promising results can be achieved in an individual's development and ability to create a product (Atkinci, 2001; Dinc, 2000). Creativity and creative thinking has become a significant skill in terms of keeping up with the changing world. Many countries strive to increase the number of creative individuals in their societies and exploit them by incorporating them into the system. Studies on creativity training have played a key role in such enterprises. The use of practices such as the creative reversal act, which is the primary concern of this study, and investigating the effects

of such techniques on promoting creativity has the potential to increase the number of creative individuals.

The creative reversal act (CREACT), which was developed by Sak (2014) in line with the Janusian thinking process, was put forward by Rothenberg and requires construction, differentiation, opposition, combination, and elaboration, respectively. As for the Janusian thinking process, it is based on the deliberate determination or development of opposing ideas or propositions in the thought process, followed by the production of new ideas, concepts, theories, and innovations through the combination of these oppositions (Sak, 2009). Janusian thinking centers on the following propositions (Sak, 2009): Existing thought is correct; the opposite of the existing idea is as correct as this thought; oppositions exist simultaneously to form contradictions; opposites are like the east and the west, and this polarity explains the idea in all aspects. It has been suggested that geniuses like Einstein have used this thinking process. The creative reversal act (CREACT), whose theoretical background rests on the Janusian thinking process, comprises five stages. These stages and related details are presented in Table 1.

Table 1

CREACT Discussion and Thinking Form.

Stage		*Discussion and Thinking questions*	*Cognitive Task / Student Task*
1. Construction (Motivation to create)		What do we know about this concept, idea, or theory? What are the advantages of using this? How do you define this concept or phenomenon?	Discover the concept, theory, or idea from different aspects.
2. Decomposition (Deviation or Separation)	*Decomposing the concept into its components*	What are some of the components, elements, or aspects of this concept? What comprises this concept? Why is it a component?	Determine the basic components and differentiates between them.
	Decomposing the components into its subcomponents	What are the subcomponents, components, or elements of this concept? What comprises these components? Why is it a component?	Determine and differentiates between the subcomponents or elements.

Table 1 Continue

3. Opposition (Simultaneous Opposition or Antithesis)	What is the opposite of this component that is as accurate or valid as itself? Is this opposition that you selected in order to explain the concept, as correct or valid as its opposite? In what aspects do these oppositions oppose themselves? (category, dimension, quantity, space, scale, etc.)	Determine the opposite of each element. Determine whether the opposites are as correct and valid as their opposites. Determine the dimensions of opposition.
4. Combination (Construction of the Theory, Discovery, or Experiment)	How do you define this concept using the opposing components so as to create a contradiction? What kind of a relationship does the new definition contain? In what aspects does the new definition explain the concept?	Determine two opposing elements in order to form a new definition. Evaluate the contradictory state of the new definition. Determine in what aspects the new definition explains the concept.
5. Elaboration	How would you like to make the new definition more contradictory or elaborate?	Reorganize the definition If necessary, add new contradictions.

Source: Sak (2014)

As can be seen in Table 1, the CREACT technique comprises five components: construction, decomposition, opposition, combination, and elaboration. In the construction stage, the student explains what s/he knows about a concept, idea, or theory. Discover a concept, theory or idea from differing aspects. Determine the basic components of the concept, theory, or ideas which s/he discovered in the decomposition stage. Determine the opposites of the components, which are as correct and valid as the original components determined in the opposition stage. Form new definitions and explanations using two opposing components in the combination stage Reorganize the formed definitions in the elaboration process, which is the final stage. After all of these stages have been completed, the learner can start from scratch and arrive at a completely different conclusion (Sak, 2014). On these grounds, the CREACT thinking process follows a spiral process.

An analysis of the related literature points to previous studies on creativity training. In a study by Ritter and Mostert (2016), it was found that Cognitive-Based Creativity Training increased creativity in university students and, thus, developed the creative problem-solving skills of learners who used divergent and convergent thinking

processes in line with increased cognitive flexibility. In another study, it was found that the use of natural elements related to living things among young children increased visual creativity (Studente, Seppala and Sadowska, 2016). In a study on the use of creative thinking techniques in science classes, sixth, seventh, and eighth graders stated that it triggered thinking about the techniques and improved creativity and problem solving (Koray, 2005). With regard to the creative reversal act, which is the primary concern of the current study, Sak and Oz (2010) documented that the practice of the creative reversal act improved creative thinking skills in students. Another study by Akar and Sengil Akar (2013) revealed that the use of creative reversal act technique in art classes increased creative thinking skills in fifth graders. In a later study, Eker and Sak (2016) found that the creative reversal act technique is favored by middle school students and thought to be effective in thinking training. Similar results have been obtained in studies on the effectiveness of creativity practices (Shaklee and Amos, 1985; Szecsi, 2008; Hendrix, Eick, and Shannon, 2012; Almutairi, 2015). As can be seen, the literature hosts studies in which various creativity training programs have been tested. However, the most crucial part of creative thinking training is the customization of programs for every age, profession, and even subject, if necessary. The testing of the effectiveness of these programs, which are expected to have certain common features with respect to creativity criteria, will only be possible through scientific research. Further studies on creativity instruction and the interpretation of the findings may facilitate increasing the quality and prevalence of such programs. The aim of the present study is to examine the practice of the creative reversal act (CREACT) technique and analyze its effectiveness concerning the level of creativity of middle school students. It is assumed that the present study will contribute to the literature of experimental research on creativity training and the CREACT technique.

In line with the research objectives, three research questions were formulated:

1. Is there a significant difference in the creativity levels of the experimental group, which performed creative reversal act (CREACT) practices, and the control group, which followed traditional instruction in line with the curriculum?

a. Is there a significant difference between the experimental group, which underwent creative reversal act (CREACT) practices, and the control group, which received instruction in line with curriculum, in terms of the subcomponents of creativity (fluency, flexibility, originality, elaboration)?

2. Is there a significant difference between the creativity pre- and post-test scores of the experimental group, which underwent creative reversal act (CREACT) practices?

a. Is there a significant difference between the creativity subcomponent (fluency, flexibility, originality, elaboration) pre- and post-test scores of the experimental group, which underwent creative reversal act (CREACT) practices?

3. Is there a significant difference between the creativity pre- and post-test scores of the control group, which underwent traditional instruction?

a. Is there a significant difference between the creativity subcomponent (fluency, flexibility, originality, elaboration) pre- and post- test scores of the control group, which underwent curriculum-based instruction?

Method

Research Design

The experimental method was employed in the present study. The experimental method is a research design through which the cause-effect relationship between the variables and the factors affecting them are examined by creating an artificial situation (Cepni, 2012). In order to investigate the research questions, the quasi-experimental method and pre-test/post-test design with control groups were employed. The independent variable was the "creative reversal act based practices" while the dependent variable was "creativity."

Research Sample

The research was carried out at a state middle school in Kdz. Eregli in Zonguldak province during the 2015-2016 academic year. The sample comprised 39 seventh grade students. There were two groups: the experimental group (19 students), which underwent CREACT-based training, and the control group (20 students), which underwent traditional curriculum-based training. The control group comprised 12 girls and 8 boys, and the experimental group comprised 11 girls and 8 boys.

Research Procedure

The study covered the "Human and the Environment," "Biological Diversity," and "Environmental Problems" units of the seventh grade Science curriculum. CREACT-based activities were devised by the researchers, and it was ensured that the activities addressed the gains required by the topics and the properties of the techniques. The practices included five activities: The first activity was related to the concept of "biological diversity." Students were asked to redefine this concept in their own words using the CREACT technique. By combining the components related to biological diversity with the opposites of such components, and using them in the same sentence, a new biological diversity definition was created. The second and third activities based on the CREACT technique were about "factors threatening biological diversity." In the second activity, the "pollution" concept was divided into its components (i.e., soil, air, water, noise). The subcomponents of these components were formed, and the students were asked to write a poem on the components and their opposites. The poem had at least four lines. In the third activity, the answers to the question, "What are the environmental problems affecting biological diversity?" were listed. Within the scope of this question, slogans were written in relation to air

and water pollution, population density, soil erosion, deforestation, and threats to sea life. The fourth and fifth activities were on "endangered living things and respect to nature." In the fourth activity, a news title creation activity was carried out, related to factors causing endangerment of species and the opposites of these factors. Newspaper clips were prepared in order to increase awareness into this topic. In the fifth activity, concepts and their opposing concepts related to "animal and plant love" were determined, and a poem writing activity was organized. The CREACT practices lasted for four weeks and including the TTCD pre- and post-tests, a total of six weeks.

Data Collection Instrument

Figural Form A of the Torrance Tests of Creative Thinking (TTCT) was used in data collection. The TTCT Figural Form test comprised three activities: forming pictures, picture completion, and parallel lines (repeated lines). TTCT yields the fluency, flexibility, originality, and elaboration subcomponents of creativity scores and the creativity total score. TTCT Figural Form A was rated by two raters and the inter-rater reliability coefficient was found to be .75. The subdimensions of creativity were: fluency, the ability to create various oral or written ideas in response to an open-ended question; flexibility, the ability to develop different approaches to a problem; elaboration, the ability to detail the proposed idea; and finally, originality, creative thinking skills related to originality in thought and act.

Data Analysis

The data collected were analyzed in SPSS using dependent and independent t-tests.

Results

In this section, the findings related to the research questions are presented. Data related to research question 1 are presented in Tables 2 and 3:

Table 2

Results of the Independent Samples t-test between the Experimental and Control Group Creativity Post-test Scores

Variable	*Group*	*N*	*M*	*S*	*df*	*T*	*p*
Creativity	Experimental	19	63.57	6.66	37	3.9	.000**
	Control	20	53.55	9.13			

According to Table 2, there is a significant difference between the experimental and control group creativity post-test scores ($t_{(37)}$=3.9, p<.01). The mean post-test scores of the experimental group (M=63.57) was higher than that of the control group

(M=53.55). The experimental group had a higher arithmetic mean than that of the control group.

Table 3

Results of the Independent Samples t-test between the Experimental and Control Group Creativity Subcomponents (Fluency, Flexibility, Originality, Elaboration)

Variables	*Group*	*N*	*M*	*S*	*df*	*t*	*p*
Fluency	Experimental	19	22.52	1.42	37	2.09	.043*
	Control	20	21.05	2.74			
Flexibility	Experimental	19	15.26	2.44	37	4.006	.000**
	Control	20	11.95	2.70			
Originality	Experimental	19	14.21	2.85	37	3,08	.004**
	Control	20	11.45	2.72			
Elaboration	Experimental	19	11.57	2.38	37	3.07	.004**
	Control	20	9.10	2.63			

An analysis of Table 3 shows that there is a significant difference between the experimental and control groups in terms of fluency post-test scores ($t_{(37)}$ =2.09, p<.05). The experimental group (M=22.52) had higher fluency post-test scores than the control group (M=21.05). The experimental and control group also significantly differed in terms of their flexibility post-test scores ($t_{(37)}$=4.006, p<.01). The experimental group had higher mean flexibility post-test scores (M=15.26) than that of the control group (M=11.95). Similarly, there was a significant between groups difference in terms of originality and elaboration post-test scores ($t_{(37)}$=3,08, p<.01) ($t_{(37)}$=3.07, p<.01). The experimental group (M=14.21) had higher post-test scores than the control group (M=11.45) in the originality test. In the same way, the experimental group had higher elaboration post-test scores (M=11.57) than the control group (M=09.10). On the basis of these results, it could be argued that the experimental group was more successful than the control group in terms of the originality and elaboration subcomponents. Data related to research question 2 are presented in Tables 4 and 5:

Table 4

Results of the Dependent Samples t-test between Experimental Group Creativity Pre- and Post-test Scores

Variable	*Measurement*	*N*	*M*	*S*	*df*	*t*	*p*
Creativity	Pre-test	19	54.36	12.55	18	3.73	.002**
	Post-test	19	63.57	6.66			

Table 4 demonstrates a significant difference between the creativity pre- and post-test scores of the experimental group ($t_{(18)}$=3.73, p<.01). The experimental group creativity post-test scores (M=63.57) were found to be higher than their pre-test scores (M=54.36).

Table 5

Results of the Dependent Samples t-test between the Experimental Group Pre- and Post-test Creativity Subcomponent (Fluency, Flexibility, Originality, Elaboration) Scores

Variables	*Measurement*	*N*	*M*	*S*	*df*	*t*	*P*
Fluency	Pre-test	19	21.52	3.93	18	1,06	.303
	Post-test	19	22.52	1.42			
Flexibility	Pre-test	19	10.36	3.11	18	7.25	.000**
	Post-test	19	15.26	2.44			
Originality	Pre-test	19	12.00	3.49	18	2.61	.018*
	Post-test	19	14.21	2.85			
Elaboration	Pre-test	19	10.47	3.48	18	1.69	.108
	Post-test	19	11.57	2.38			

Table 5 shows that there is no significant difference between the fluency pre- and post-test scores ($t_{(18)}$=1.06, p>.05) of the experimental group, which underwent CREACT practices. However, the experimental group fluency post-test scores (M=22.52) were higher than their pre-test scores (M=21.52). A significant difference was also found between the experimental group flexibility pre- and post-test scores ($t_{(18)}$=7.25, p<.01). The experimental group flexibility post-test scores (M=15.26) were higher than that of their pre-test scores (M=10.36). With regard to the experimental group originality pre- and post-test scores, a significance difference was found ($t_{(18)}$=2.61, p<.05). The experimental group originality post-test scores (M=14.21) were found to be higher than that of their pre-test scores (M=12.00). No significant difference was found between the experimental group elaboration pre- and post-test scores ($t_{(18)}$=1.69, p>.05). However, the experimental group elaboration post-test scores (M=11.57) were found to be higher than their pre-test scores (M=10.47)

Data related to research question 3 are presented in Tables 6 and 7.

Table 6

Results of the Dependent Samples t-test between Control Group Creativity Pre- and Post-test Scores

Variables	*Measurement*	*N*	*M*	*S*	*df*	*t*	*P*
Creativity	Pre-test	20	48.20	9.27	19	1.96	.064
	Post-test	20	53.55	9.13			

According to Table 6, there is no significance difference between the control group creativity pre- and post-test scores ($t_{(19)}$= 1.96, p>.05). However, the control group creativity post-test scores (M=53.55) were found to be higher than that of their pre-test scores (M=48.20).

Table 7

Results of the Dependent Samples t-test between the Control Group Creativity Subcomponent (Fluency, Flexibility, Originality, Elaboration) Pre- and Post-test Scores

Variables	*Measurement*	*N*	*M*	*S*	*df*	*t*	*P*
Fluency	Pre-test	20	15.10	3.43	19	5,54	.000**
	Post-test	20	21.05	2.74			
Flexibility	Pre-test	20	10.80	2.70	19	1.47	.158
	Post-test	20	11.95	2.70			
Originality	Pre-test	20	12.20	2.70	19	1.05	.304
	Post-test	20	11.45	2.72			
Elaboration	Pre-test	20	10.10	2.17	19	1.42	.171
	Post-test	20	9.10	2.63			

Table 7 demonstrates a significant difference between the control group fluency pre- and post-test scores ($t_{(19)}$=5.54, p<.01). The control group fluency post-test scores (M=21,.05) were higher than their pre-test scores (M=15.10). No significant difference was found between the control group pre- and post-tests of flexibility ($t_{(19)}$=1.47, p>.05), originality ($t_{(19)}$= 1,05, p>.05), and elaboration ($t_{(19)}$= 1.42, p>.05).

Discussion and Conclusion

The following were concluded on the basis of the present study: There was a significant difference between the experimental group, which underwent creative reversal act (CREACT) training, and the control group, which underwent curriculum-based training in terms of creativity scores. The experimental group had higher scores than the control group. There was a significant difference between the two groups in terms of the subcomponents of creativity (fluency, flexibility, originality, and elaboration). The experimental group was more successful in terms of fluency, flexibility, originality, and elaboration. There was a significant difference between the creativity pre- and post-test scores of the experimental group, which underwent creative reversal act (CREACT) practices, with higher scores on the post-test. There was a significant difference between the experimental group pre- and post-test scores in terms of the subcomponents of flexibility and originality, with higher scores on the post-test. No significant difference was found between the pre- and post-test creativity scores of the control group, which underwent curriculum-based training. Of the subcomponents of creativity, there was a significant difference only between the fluency pre- and post-test scores, with higher scores on the post-test. The results have revealed that the practice of creative reversal act (CREACT) technique in the teaching of a science subject (ecosystem) promoted the creativity level of seventh grade students. The results of such programs whose effectiveness have been tested with regard to creativity training demonstrate that student creativity can be improved.

An analysis of the reported results in the related literature supports the findings of the present study. In a study by Sak and Oz (2010), it was found that the practice of creative reversal act techniques improved creative thinking skills in students. Another study by Akar and Sengil Akar (2013) illustrated that the use of the creative reversal act technique in art classes increased creative thinking skills in fifth graders. In an experimental study on creativity, it was understood that the use of live plants and natural elements in the classroom increased visual creativity skills in students (Studente, Seppala and Sadowska, 2016). Another research by Shaklee and Amos (1985) demonstrated that there was an increase in the problem-solving skills of students who utilized CREACT techniques during the process. Many studies on the effectiveness of the creativity practices have yielded similar results (Szecsi, 2008; Hendrix, Eick, and Shannon, 2012; Almutairi, 2015). In addition, it has been argued that classroom environments that promote creativity give students the freedom to make choices, put forward different ideas, and accept different ideas, which increase their self-confidence. On the other hand, in classroom environments that are not creative, student ideas are not taken into consideration and the authority of the teacher is noticeable (De Souza Fleith, 2000). Creating classroom environments in which creativity is highlighted and used is important in terms of increasing the quality of education. Conducting experimental studies on the effectiveness of creativity training and the interpretation of the obtained data may increase the quality and prevalence of such programs. Both CREACT techniques and other

creativity trainings will contribute to practitioners who will perform related activities. However, instead of working with few participants, which is a limitation of the present study, more individuals should be included in such studies.

The following recommendations can be made on the basis of the present research:

It is presumed that the utilization of the creative reversal act (CREACT) and related programs in Science and Technology, Social Sciences, Turkish, Mathematics, Art, Music, etc. classrooms will increase student creativity and other high-order thinking skills and academic success. In education programs in Turkey, creative thinking is one of the basic principles within the framework of the constructivist approach. For these reasons, creative reversal act practices should be given more importance at different stages of formal education. In this respect, students can be given in-service training seminars on how to use the technique in science and other appropriate classes In addition, sample practices related to how this program can be applied as well as theoretical information should be provided to pre-service teachers. Further studies might test the effectiveness of the CREACT technique in different courses and samples. Qualitative or mixed-design studies can be designed in order to understand whether the technique is practical.

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Fen Öğretiminde Yaratıcı Zıt Düşünme Tekniğinin Uygulanmasının Ortaokul Öğrencilerinin Yaratıcılık Düzeylerine Etkisi

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Özet

Problem Durumu: 21. yüzyılda bütün toplumların en önem verdiği konuların başında, toplum bireylerinin ne derece yaratıcı olabileceği olgusu gelmektedir. Çünkü bireylerin yaratıcılığı yani özgün fikirler üretebilmeleri, bulundukları toplumun kalkınmasını sağlayacak ve refah düzeyini yükseltebilecek anahtar bir role sahiptir. İyi fikirler karmaşık yapılı problemler için etkili çözümler anlamına gelebileceği gibi, pazar payı yüksek olan her türlü ürüne dönüşme özelliği de taşır. Bireylerin yaratıcılığını dolayısıyla niteliğini arttırmak "eğitim" alanı ile ilişkili olup, salt teorik bilginin önemsendiği ve standartların yerine getirildiği bir anlayıştan ziyade, eğitimde kalitenin ön planda tutulduğu "yaratıcılık eğitimini" işaret etmektedir. Yaratıcılık ve yaratıcı düşünme, değişen dünyaya uyum sağlamada çok önemli bir beceri olarak değerlendirilmektedir. Pek çok ülke kendi toplumlarındaki yaratıcı bireylerin sayılarını arttırmak ve de sistemin içerisine dâhil ederek onlardan faydalanmak adına girişimlerde bulunmaktadır. Yaratıcılık eğitimi üzerine yapılan çalışmalar bütün bu girişimler için anahtar role sahiptir. Bu çalışmanın da konusunu oluşturan yaratıcı zıt düşünme tekniği gibi pek çok uygulamanın yaratıcılık eğitimi bağlamında kullanılması ve bu tür tekniklerin bireylerin yaratıcılıklarını geliştirmedeki etkilerinin incelenmesi yaratıcı bireylerin sayısını arttırabilecek bir potansiyele sahiptir.

Araştırmanın Amacı: Bu çalışmanın amacı, ekosistem konusu üzerine yaratıcı zıt düşünme tekniğinin (YAZID) uygulanmasının ortaokul öğrencilerinin yaratıcılık düzeylerine etkisini incelemektir. "Yaratıcılık" bağımlı değişkeni üzerindeki etkisi

incelenen bağımsız değişken "yaratıcı zıt düşünme tekniğine dayalı uygulamalar" dır. Araştırmanın amacı doğrultusunda belirlenen sorular şu şekildedir:

1. Yaratıcı zıt düşünme (YAZID) tekniği uygulamalarının yapıldığı deney grubu ile müfredata uygun öğretimin yapıldığı kontrol grubu arasında yaratıcılık düzeyi açısından anlamlı bir farklılık var mıdır?

a. Yaratıcı zıt düşünme (YAZID) tekniği uygulamalarının yapıldığı deney grubu ile müfredata uygun öğretimin yapıldığı kontrol grubu arasında yaratıcılığın alt boyutları (akıcılık, esneklik, orijinallik, ayrıntılılık) açısından anlamlı bir farklılık var mıdır?

2. Yaratıcı zıt düşünme (YAZID) tekniği uygulamalarının yapıldığı deney grubu öğrencilerinin yaratıcılık ön test ve son test puanları arasında anlamlı bir farklılık var mıdır?

a. Yaratıcı zıt düşünme (YAZID) tekniği uygulamalarının yapıldığı deney grubu öğrencilerinin yaratıcılığın alt boyutları (akıcılık, esneklik, orijinallik, ayrıntılılık) ön test ve son test puanları arasında anlamlı bir farklılık var mıdır?

3. Müfredata dayalı uygulamanın yapıldığı kontrol grubu öğrencilerinin yaratıcılık ön test ve son test puanları arasında anlamlı bir farklılık var mıdır?

a. Müfredata dayalı uygulamanın yapıldığı kontrol grubu öğrencilerinin yaratıcılığın alt boyutları (akıcılık, esneklik, orijinallik, ayrıntılılık) ön test ve son test puanları arasında anlamlı bir farklılık var mıdır?

Araştırmanın Yöntemi: Araştırmada deneysel yöntem kullanılmıştır. Araştırma problemlerini incelemek için, deneysel yöntemler içerisinden yarı deneysel yöntem ve öntest-sontest kontrol gruplu desen kullanılmıştır. Araştırmanın yöntemine uygun olarak çalışma grubunu, bu okulda öğrenim gören 39 7. Sınıf öğrencisi oluşturmaktadır. Araştırma verilerini toplamak için Torrance Yaratıcı Düşünme Testi (TYDT) Şekilsel A formu kullanılmıştır. Araştırma kapsamında elde edilen veriler SPSS paket programında bulunan bağımlı ve bağımsız gruplar için t-testi yöntemlerine göre analiz edilmiş ve araştırma bulgularına ulaşılmıştır.

Araştırmanın Bulguları: Yaratıcı zıt düşünme (YAZID) tekniğinin uygulandığı deney grubu ile müfredata uygun öğretimin yapıldığı kontrol grubu arasında yaratıcılık puanı açısından deney grubu lehine anlamlı bir farklılık vardır. ($t_{(37)}$=3,9, p<.01). Yaratıcılığın alt boyutları akıcılık ($t_{(37)}$ =2,09, p<.05), esneklik ($t_{(37)}$=4,006, p<.01), orjinallik ($t_{(37)}$=3,08, p<.01) ve ayrıntılılık ($t_{(37)}$=3,07, p<.01) açısından her iki grup arasında anlamlı farklılık tespit edilmiş olup, farklılık deney grubu lehinedir. Yaratıcı zıt düşünme (YAZID) tekniği uygulamalarının yapıldığı deney grubu öğrencilerinin yaratıcılık ön test ve son test puanları arasında anlamlı bir farklılık vardır ($t_{(18)}$=3,73, p<.01). Farklılık deney grubunun sontest puanları lehinedir. Yaratıcılığın alt boyutlarından esneklik ($t_{(18)}$=7,25, p<.01) ve orjinallik ($t_{(18)}$=2,61, p<.05). açısından deney grubunun öntest ve sontest puanları arasında, sontest puanları lehine anlamlı bir farklılık vardır. Müfredata dayalı uygulamanın yapıldığı kontrol grubu öğrencilerinin yaratıcılık toplam ön test ve son test puanları arasında anlamlı bir

farklılık yoktur ($t_{(19)}$= 1,96, p>.05). Yaratıcılık boyutlarından sadece akıcılık açısından kontrol grubunun öntest ve sontest puanları arasında anlamlı bir farklılık vardır ($t_{(19)}$=5,54, p<.01). Bu boyut açısından farklılık kontrol grubunun sontest puanları lehinedir.

Araştırmanın Sonuçları ve Önerileri: Araştırma sonuçlarına göre; bir fen konusu (ekosistem) üzerine yaratıcı zıt düşünme tekniğinin (YAZID) uygulanmasının ortaokul 7. Sınıf öğrencilerinin yaratıcılık düzeylerini geliştirdiği tespit edilmiştir. Yaratıcılık eğitimi bağlamında etkisi sınanan bu tür programların ortaya koyduğu sonuçlar, öğrencilerin yaratıcılıklarının geliştirilebileceğini göstermektedir. Ayrıca öğretmenler tarafından yaratıcılığın ön plana alındığı ve kullanıldığı sınıf ortamlarının hazırlanması, okullarda verilen eğitimin kalitesini arttırma adına da önemlidir. Öğretmenlerin Fen Bilimleri dersi ve Sosyal Bilgiler, Türkçe, Matematik, Resim, Müzik vb. gibi diğer derslerde yaratıcı zıt düşünme (YAZID) ve benzeri programları kullanmaları önerilmektedir. Çünkü bu tür programların yaratıcılığın yanı sıra diğer üst düzey düşünme becerilerini de arttıracağı öngörülmektedir. Ayrıca hizmet içindeki öğretmenlere tekniğin fen derslerinde ve uygun olan diğer derslerde nasıl uygulanacağına yönelik hizmet içi eğitim seminerleri verilebilir. Öğretmen adaylarına da teorik bilginin yanı sıra yöntemin nasıl uygulanacağına ilişkin örnek uygulamalar lisans öğrenimleri boyunca gösterilmelidir.

Anahtar Kelimeler: Janusian düşünme süreci, Torrance yaratıcı düşünme testi, insan ve çevre ünitesi, deneysel çalışma.